School Shop

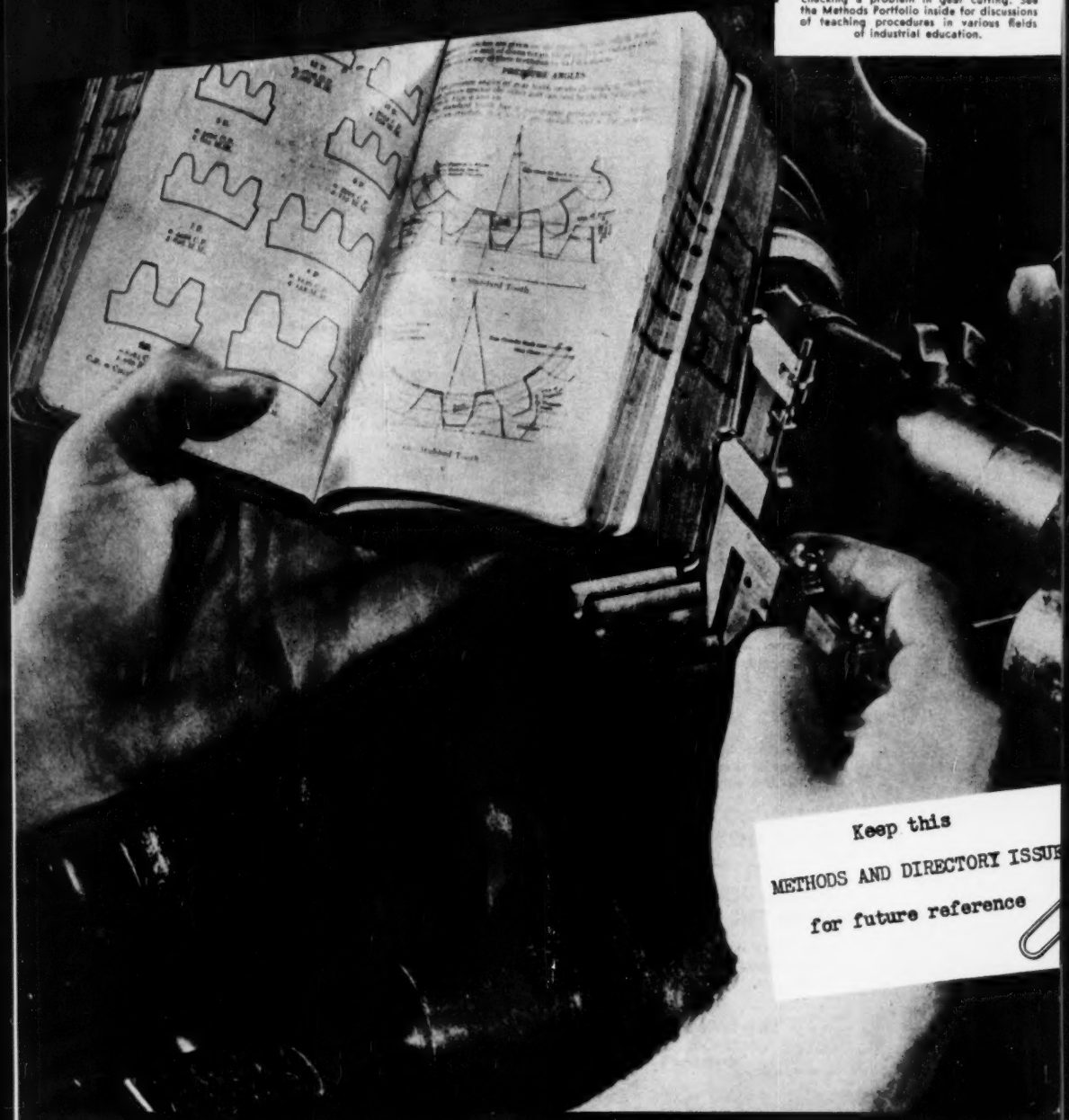
vol. X no. 8

APRIL, 1951

Special Methods and Directory Issue

Teaching Methods Portfolio
Suppliers Directory
New Instructional Materials
Directory of Officials

On the cover: A machine-shop student checking a problem in gear cutting. See the Methods Portfolio inside for discussions of teaching procedures in various fields of industrial education.



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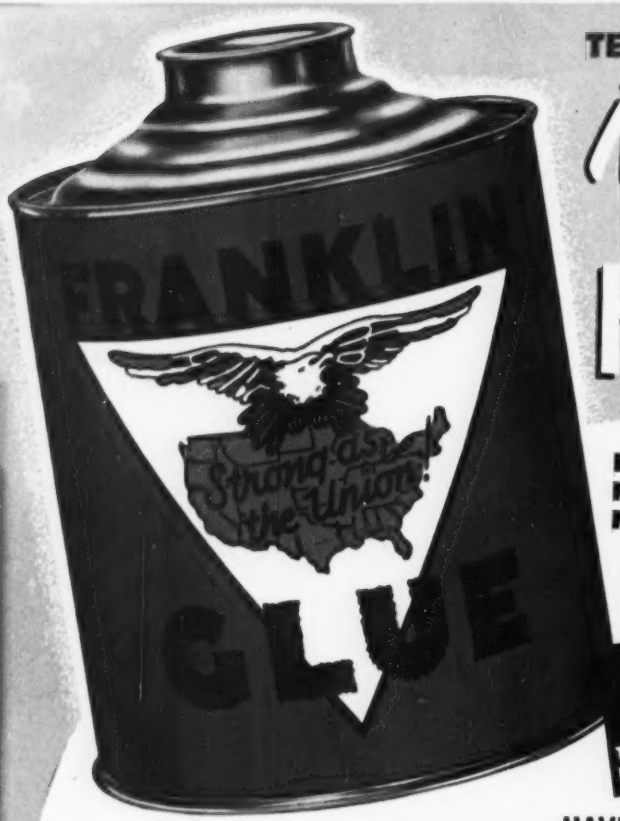

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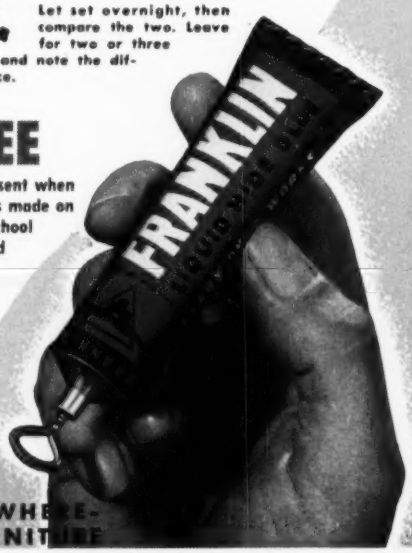

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School Shop

FOR INDUSTRIAL EDUCATION TEACHERS

CONTENTS **Vol. X, No. 8** **APRIL, 1951**

I. SCHOOL SHOP METHODS PORTFOLIO

Teaching for Understanding. Thomas Diamond..... 5
Topics such as deciding what to teach, lesson preparation and presentation, marking, and testing are discussed in this article together with tips on ways to teach effectively.

Teaching Methods for the General Shop. Roy G. Fales..... 7
An outstanding exponent of the general shop gives specific recommendations for achieving pupil selfdirection so that maximum learning may result.

Learning in the Auto Shop. Ray F. Kuns.....13
Methods in teaching both industrial-arts and vocational auto shop are outlined in this article which points up the increasing interest in auto mechanics among youngsters today.

Make Woodworking Challenging. Heber A. Sotzin.....17
More group projects and fewer projects for projects' sake are advocated by the author who gives detailed examples of the newer approaches in teaching woodworking.

Organize Machine-Shop Learning. John T. Shuman and L. H. Bardo.....26
Such factors as allowance for individual differences and the necessity for teaching inspection and control methods are covered by the authors in this presentation of modern-day machine-shop teaching.

Stimulating Learning in Metalworking. Dewey F. Barich.....37
Group discussions and demonstrations are more effective than lectures in achieving learning and enthusiasm says the author who raises questions about teaching techniques and then supplies the answers.

Plan Meaningful Radio Lessons. A. A. Vezzani.....41
Procedures are outlined in this article which the radio teacher can use to make his instruction more effective.

Drawing Can Be Made Interesting. S. L. Coover.....45
The emphasis in drawing should be shifted from the traditional approach to a more functional type of instruction with more time given to the information and skills which will be useful to the average student in later life, states the author.

Stress What's New in Electricity. T. Glade Wilcox.....47
Much of what is now taught in electricity should be abandoned, contends the author, who outlines methods of teaching and evaluating newer course content.

Modernize Your Graphic-Arts Course! R. Randolph Karch.....53
Teaching hand composition and feeding the platen press are not enough in today's technological developments in the printing industry, says Mr. Karch, who gives details of what the modern course should contain and how it should be taught.

II. EQUIPMENT AND SUPPLIES

Suppliers' Directory.....62
An extensive, up-to-date guide to sources of equipment and supplies arranged by types of materials. A handy year-round reference for the purchase of all shop needs.

III. INSTRUCTIONAL MATERIALS

New Visual Aids in Industrial Education.....73
New films, filmstrips, charts, instructional materials, and new visual equipment which have appeared recently.

New Books in Industrial Education.....77
New titles arranged by subject matter so that you can check to make sure that you are familiar with the latest books in your field.

IV. DIRECTORY OF OFFICIALS

Directory of Federal and State Officials.....84
A comprehensive and up-to-date directory of officialdom in the industrial-education field.

V. REGULAR FEATURES

School Shop Talk—Editorial Comment..... 2
Diamond Dust. Thomas Diamond.....34
Jigsaw Jones. Aaron Adams.....34
In the Morning Mail.....58
News.....95
From Washington. School Shop Washington Bureau.....96
Index to Advertisers.....96

CCA

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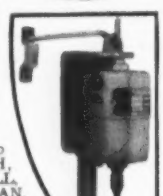

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School Shop TALK

COMMENTS ON ISSUES FACING INDUSTRIAL EDUCATION

What Is Good Teaching?

This issue of SCHOOL SHOP is devoted to that most tenuous of objectives—good teaching. It is hard to put your finger on the specific elements that make teaching good. Like most arts, it evades standard diagnoses.

Not so long ago in most schools—and still in some schools—it was a matter of learning a lesson which meant memorizing facts or performing skills at an acceptable level, displaying these facts or skills to the teacher, and then receiving a mark to record the degree of achievement. This whole procedure made things relatively simple for the teacher. His objective was clearly stated, his methods were outlined for him, and his measurement was positive if not scientific.

But now the objectives of the school have broadened. Even vocational courses are not taught for achievement of saleable skills alone. The future artisan will also be a citizen, a father, a member of organizations, and a consumer. Good teaching means that all these phases of his future life must be considered.

The industrial-arts student likewise will be all these things as well as a member of an occupational group the nature of which he may not yet know.

The objectives of shop teaching look toward the total maturity of the individual as he steps into his place in adult society. Good teaching recognizes this aim and provides learning situations that will lead to its fulfillment.

The problem arises in defining the elements of full maturity and in providing specific measures in the shop learning situation that will help in attaining the goal.

Skills are important, of course, but they are not the whole story. The articles in this issue outline teaching methods that can be helpful in achieving the artistry of teaching, particularly in the area of skills. You will notice, however, that many of the methods described in these articles go beyond skill acquisition and are concerned with broader aims.

The list of these aims is legion. They include among others the achievement of understanding and insight; the development of good attitudes toward self, toward others collectively and individually; the awakening of interests; the stimulation of thought processes; the ability to weigh evidence and collate data; the power to criticize conclusions; the acceptance of social responsibility; the ability to work with others; and the development of creativity.

Good teaching takes these aims and more into consideration. Partly it is done intuitively and partly through planned procedures. The good teacher, the remembered teacher, the teacher with impact, uses lesson plans, examinations, shop organization, and a multitude of methods to achieve these ends. But he also uses his emotions. He has a "feeling" for young people and their interests, aptitudes, and resources.

The problem of good teaching is to relate the aims and objectives discussed here to the learning of students. This is where the methods of teaching—no matter what the course—come into the picture. Foresight and thoughtfulness are required. These attributes are difficult to achieve and do not fall like manna from on high. Their attainment requires the difficult effort of cerebration which we humans occasionally achieve but avoid, if possible.

This is where the foresight mentioned above comes in. Definite planning is required so that specific teaching to gain objectives takes place.

Too often the cart-before-the-horse technique is used when teaching methods are justified with lists of aims and objectives. The teacher can readily go through a list and say that a certain objective is attained through a procedure which the teacher has followed for years. Ergo, the teaching is satisfactory, it strives for the objective, action is taking place. This is particularly true of the broader objectives mentioned earlier. In reality this approach is wishful thinking and irrational.

Good teaching means establishing aims and objectives *first* and then using the personal resources of the teacher plus the school facilities to do the job. Often the personal resources are the more important of the two.

Good teaching is a constellation of factors that vary with individual teachers and with different school settings. Selfevaluation by the teacher of his personal attributes so that strengths can be utilized will make success more likely. Full satisfaction is seldom achieved but the joy comes in the effort and the reward in evidence of pupil development.

—*L.W.P.*

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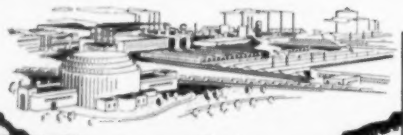

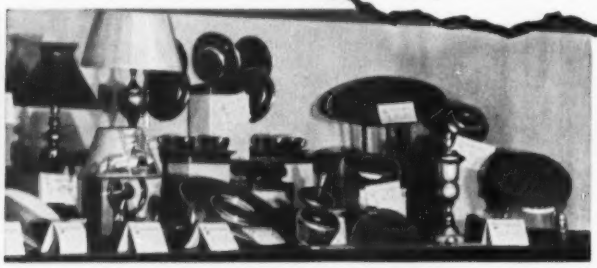

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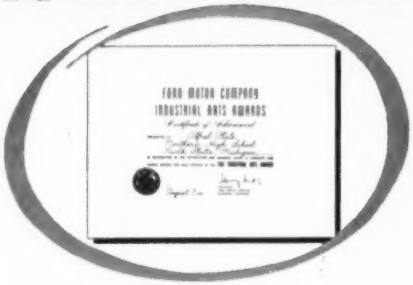

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Teaching for Understanding

By Thomas Diamond

Every shop teacher worthy of the name wants his pupils to get the most out of his instruction. Indeed, this should be the central aim of all teaching. The author, retired head of the Department of Vocational Education, School of Education, University of Michigan, contends that methods have a profound effect on the kind of teaching a teacher does. He suggests that each teacher ask himself how he can improve on them, and in this article gives some tips on effective instruction. From this general discussion of teaching methods, readers of SCHOOL SHOP will find a logical sequence in the rest of the articles in this issue which deal with teaching methods in each of the industrial-education fields.

THIS issue is intended to bring to the attention of shop teachers various methods of performing the many tasks with which they are faced in daily contact with their pupils.

Deciding What To Teach

Perhaps the first job the teacher must think of, after he has been appointed and assigned to a school, is that of determining what he will teach. Naturally enough this will depend to some extent on the types of pupils he expects to have. If the class should be composed of mature individuals, as in an evening school, the chances are that the content of his course will differ from what would be suitable for a group in a junior-high school.

Another factor to be considered in determining what to teach is the time available. If the class meets one hour each week it is obvious that the course will differ from one intended for a class which meets for three hours each day. Added to this one must consider the equipment available.

There are other considerations which must be taken into account, but the point to be made here is that *the teacher must make an inventory of what he can teach in the field for which he is responsible.* From this inventory he selects the items which are suitable for the particular group he must teach, giving due consideration to the time he expects to spend with them, and to the facilities with which he will work.

After segregating the material to be taught, his next job is to list the various items in an appropriate teaching order —with the simple ideas first, and leading gradually to those that are more complex.

Preparing for the Lesson

When he has decided on what to teach, the teacher still has the responsibility of presenting the material to his class. To do this effectively, it is important that he make some preparation.

Some teachers follow the practice of outlining on a card the procedure they propose to follow. They list the points they wish to make in the demonstration, the steps they expect to follow, and the tools and materials they will need. Also, the teacher may have a list of questions to ask to determine how well the pupils have learned what it was hoped they would learn. With this card as a guide, and just before the demonstration, the teacher checks the items in order to insure that he has at his hand everything he will need.

This plan has the added advantage that it may be used at any time in the future when the teacher has to present the same lesson to another group. After each presentation, any unusual questions or problems that arise during the session may be recorded on the card and serve as a guide in the future. Thus there is built up a cumulative record of the experience gained in presenting the lesson over a number of years.

Presenting the Lesson

There are occasions when the lesson can best be presented by a lecture. When this is true, it is always good practice to supplement the presentation with such illustrative devices as pictures, films, or samples of workmanship or materials.

On the other hand, when manipulative processes are involved the chances are that a demonstration is more appropriate than a lecture. However occasions arise when a happy combination of both is desirable.

Regardless of which method is used, the teacher must keep in mind that the interest span of young people is relatively short. Moreover, it is well to remember that it is unwise to use too great a proportion of the class time available in the presentation of the lesson. In view of this some teachers have adopted the policy of limiting their demonstrations to 20 minutes. The question of whether this is too long or too short is debatable, of course, but it is a sound policy to have more and shorter demonstrations than fewer and longer ones. It would seem therefore that the teacher is wise who arranges his material in such a fashion as to insure that what he presents is well within the comprehension of the slowest pupil.

Asking Questions

Before the actual presentation of the new lesson it is customary for the teacher to assure himself that his pupils are at a point where they will be able to grasp whatever the lesson contains. Some teachers do this by asking questions concerning what should have been learned in previous lessons. If the response is good they can proceed with the new lesson with assurance. On the other hand if the response is such that some pupils appear to lack an understanding of the principles on which the new lesson is based, the teacher should recognize the need for clarifying the points which have been forgotten before he proceeds with the new subject matter. Sometimes these questions are prepared in advance, and have a place on the teacher's lesson plan.

The question of whether to demonstrate to the whole class, or to make the instruction individual, is one which causes some discussion among teachers. Obviously no single method will fit all cases; however, a happy combination of both is effective in most situations. The general tendency is to demonstrate to the class as a whole. When the pupils return to their work stations, the teacher takes a position at a point where he can observe how the pupils are applying what was demonstrated. As a rule a good proportion of the class will be performing satisfactorily, but, here and there, there are likely to be a few individuals whose reaction indicates that they need help. At this point individual instruction becomes valuable.

Testing Methods

Testing is a task for which the teacher is responsible, and it is a topic which causes considerable discussion in professional meetings. The respective merits of true-false, completion, oral, and essay-

type tests have been bandied around among teachers for years. All of these have their merits, and can be used when the time seems appropriate. However, it is felt by some that testing is a definite part of the teaching function which goes on constantly all through the class period.

The pupil is being tested when the teacher is attempting to find out how much he knows, in order that he can take the boy from where he is to where he wants him to be.

He is being tested as he works on his project, and applies, with greater or less skill, the principles he has observed in the teacher's demonstration. As the teacher observes the pupil's reaction, he is likely to classify him in relation to his fellows in the class.

Then the wise teacher, as he moves about in the class, is constantly asking questions such as: Why do you do this? Why do you do it in this particular way? Why do you use this kind of material? These are not idle questions. They are asked for the specific purpose of stimulating the thinking of the pupils, and to determine the extent to which they understand what they are doing.

If the teacher is alert, and is conscious of the opportunities for testing which are always present, the less need he will have for the more formal types of tests. He will know at any given time the strength and weakness of each pupil, and will thus be in a position to rate all the pupils on the basis of the information he has.

Grading Procedures

Among the many reports called for by school administrators is one which indicates the standing of each pupil in relation to others in his class. As a rule, the differences in these standings are expressed in figures, letters, or in such expressions as Excellent, Good, or Fair. Since an expression of this kind is required in most schools it may be profitable to discuss the practice briefly here.

It is believed that few will dispute the assertion that the form in which the evaluation or grade given a pupil is expressed is of little moment. This fact is illustrated by the following table:

Grade Expressed in:

Figures	Letters	Words
100	A	Excellent
95	A−	
90	B+	Good
85	B	
80	B−	Fair
75	C+	
70	C	Poor
65	C−	
60	D	

A table of this kind is valuable when averages have to be computed, because the letters or words may be transposed into figures, and, after the average has been determined, the result may be brought back to its appropriate column.

It will be noted that the figures are listed in units of five as it is our feeling that intervals of one or two are too minute to be significant. However, the actual numbers used are insignificant, and any teacher may use whatever numbers he pleases, provided he establishes them as his standard.

Are Grades Necessary?

There are those who feel that it is unnecessary to give grades in any phase of a pupil's work. Others believe that one grade, given at the end of the term, is sufficient for all purposes. However it is difficult to evaluate what a pupil has done in a class by reflecting on what has happened to him, or how he has reacted to the various assignments which have been made during the term.

The tendency is to base the final grade on the quality of the work done on the projects the pupil has made. When we do this, we fail to recognize that a fair job, done by one who perhaps is less able, may deserve a better grade than one which was produced by a pupil who might have done a great deal better than he did. Nor does it recognize that one pupil may have done vastly more work than another.

The reports turned in by the pupil, the progress he has made, the tests given, and the general behavior of the pupil are all important in determining the final grade given. Hence it seems important that an effort be made to treat each one of these factors separately, and that an average of all be used to determine what the final grade shall be.

For example, the workmanship displayed in the projects should be evaluated independently of all other factors. The time element is important so the pupil who produces more should be graded higher than the one who produces less. Here again time is evaluated independently of quality or any other factor.

Giving Separate Grades

Separate grades should be given on tests, reports, and citizenship, and these, combined with the grades on quality and quantity, should be averaged in order to determine the final grade to be given.

This procedure has the advantage that it gives credit for excellence, and enables the pupil who may be weak in one area to raise his final grade because of his excellence in some other area. Moreover, it has the added advantage of enabling the teacher to explain to the pupils or parents specifically why a particular grade was given.

Whatever the opinion of a teacher is in regard to grading, regardless of the form of the grade, we know that in most school systems grades are required by the administration, and by many of the parents. Moreover, the pupils have become accustomed to receiving grades—good or bad. Therefore, the teacher should establish for himself a standard system in which specific factors are graded independently. These factors might be confined to quality of work and citizenship, or it might include such things as quantity of work, progress of pupil, tests, or reports. Regardless of the factors used, each one should be graded independently of all others.

Keeping Records

The keeping of records is an activity which many teachers resent. In their estimation, the operation involves the expenditure of time which had better be spent on teaching. However, if the teacher hopes to benefit from his experience, there are some items of information for which he should not rely on his memory. For example, when he prepares his requisitions, he should know rather definitely how much material is needed, per pupil, to make certain projects. This knowledge can be obtained only by having a record of how much has been used in the past.

Tools are subject to loss or damage. This reduction in the available equipment must be replaced each year if the equipment is to be kept up to standard. In view of this, it is desirable that the teacher be able to say definitely how many of this or that must be ordered. It is not a matter of guessing—he actually knows that certain items are more subject to loss or breakage than others.

If the teacher is to be able to take a positive stand when presenting his requisitions, he must have evidence, based on a record of years, that his orders are not mere guesses.

Again a teacher should feel it to be his responsibility to note the progress that each pupil is making. The only means by which he can be intelligent about this question is by keeping a record of what his pupils are doing.

Many other types of information should be available if the teacher hopes to talk with assurance about his work. Much of this information can be secured only on the basis of accurate records. The keeping of such records may seem an unwarranted drain on the teaching time, but much of the clerical work can

(Continued on page 56)

Teaching Methods for the General Shop

By Roy G. Fales

Pupil selfdirection is the key to successful teaching in the general shop. In this article the shop teacher will find specific recommendations for conducting the general-shop program. Roy G. Fales is an outstanding exponent of the general shop and is Acting Chief, Bureau of Industrial-Arts Education, New York State Education Department, Albany.

WHEN teachers prescribed projects to be constructed, and all pupils made the same article virtually in unison, teacher-directed work flourished. With the coming of the general shop concept, it became necessary to develop new methods of working with pupils. Teacher direction gave way to pupil selfdirection and learning under the guidance of the teachers. This change required a different type of learning and teaching environment. Shops changed in appearance, instructional aids became more important, and the innate drive of interest became a motivating factor. It was no longer imperative that the instructor stimulate his pupils to construct articles which they did not care to take home. The change in "setting" brought more attractive and better-organized shops, and the teacher found it necessary to hustle to keep up with the pupils.

Meeting individual interests.—Individual work in a general shop may involve as many different jobs as there are pupils in the class, but as a rule it does not. Pupils seem to "follow the leader" and make the same article that is being or has been made successfully by another pupil. Teachers can and do control the spread of work to the point where they can cope with the teaching problems, but because of the opportunities for differentiation the articles constructed do cover a very wide range of interests during the school year. This makes it necessary to develop pupil selfdirection, pupil planning, and an organization of instructional materials and equipment which will relieve the teacher of considerable detail.

The teacher and the individual.—Assuming that the pupil is the focal point in the general shop, teachers will encourage him to select a construction project of interest, and then help him plan the manipulative work so that it is within his ability and the time available. Before, during, and after construction the teacher will ask the pupil many leading questions which will cause him to think and also to seek answers.

Organized group instruction.—Pupils should be called together for group instruction daily or weekly. Determination as to the nature of the lesson or demonstration is made by the teacher.

One of the factors which aids the teacher is a well-organized course of study including a list of lesson topics which will be taught to all pupils in the class at an appropriate time, depending largely on pupil activities. At the beginning of the term emphasis should be given to ways of locating printed directions and helps together with suggestions for selfdirection and planning. It is also desirable for the teacher to give a large number of demonstrations at this time. Later in the term it is common for instructors to give greater attention to the related information which distinguishes industrial arts from other types of shop courses.

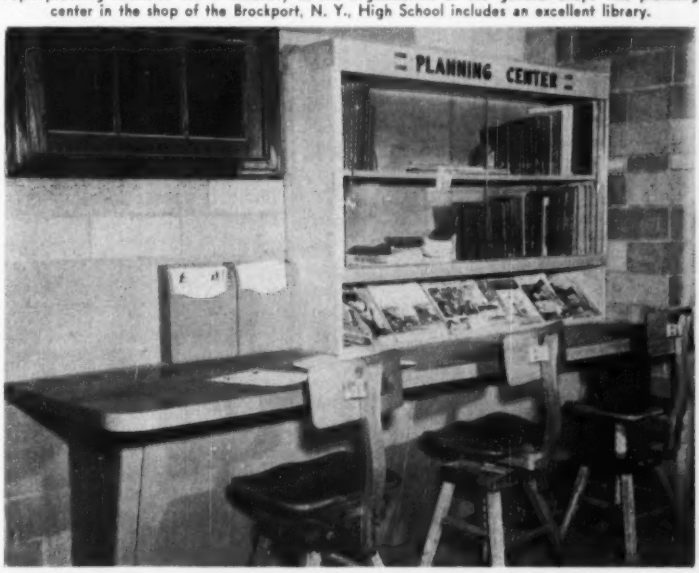
Related information.—Pupils have a tendency to want to make project after project without study. Teachers have an obligation to set the stage for pupil learning. While the primary feature of industrial arts is shop work, it should be closely related to shop sketching and reading of mechanically made drawings, mathematics, social studies, science, art, a study of industry, and possibly other subjects. As the pupil sees the relationship between industrial-arts work and the rest of the curriculum, the entire school program will assume more significance.

Preparation for a lesson.—The nature of the demonstration or related lesson topic will determine what preparations are needed. If a demonstration is planned, the necessary tools and materials must be laid out ready for work. In order to simplify the demonstration it may be desirable to perform a few of the preliminary steps in advance. Frequently a diagram will be placed on the chalk board to facilitate understanding. A list of the steps to be demonstrated, placed on the blackboard or dictated to the pupils, will help them to follow the demonstration as it progresses.

When a related lesson topic is to be given, materials, charts, pictures, diagrams, or teaching aids which will make the subject matter clear should be previously assembled ready for use.

Facilities for planning.—General shops

Pupil planning facilities are a necessity in the organization of the general shop. This planning center in the shop of the Brockport, N. Y., High School includes an excellent library.



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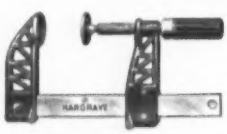

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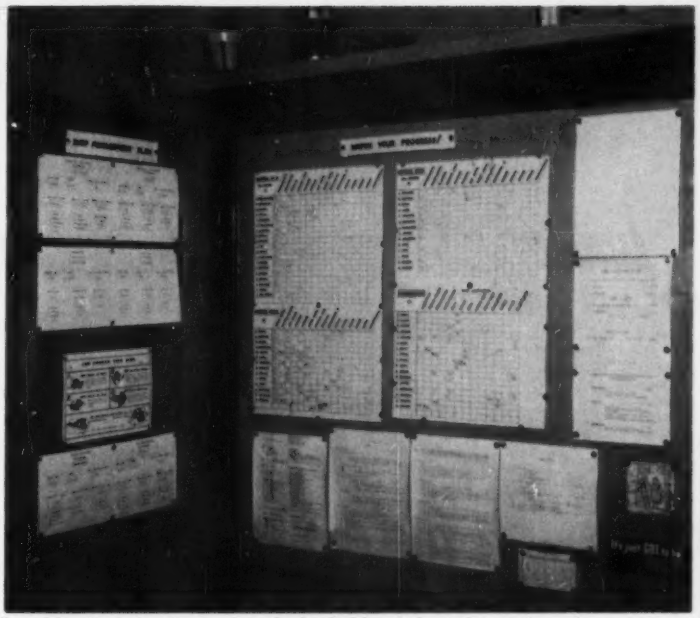
are organized with the assumption that there will be a great deal of individual pupil learning, pupil thinking, and pupil planning of their own work. By the very diversity of the equipment, pupils and teacher alike stray into unknown areas of work which demand or bring new experiences.

Most teachers of general shops therefore find it necessary to develop a library and planning center consisting of a study table, three or four chairs, mechanical drawing equipment, a tracing box, reference books, magazine clipping file, and a card-catalog file for the purpose of allowing rapid finding of project ideas, instructional material, and related information.

The planning technique.—Many pupils seeking information regarding ways of constructing a particular article, such as a boat, are able to make a shop sketch showing the size and characteristics of the boat which they wish to build. Others not fortunate enough to have substantial ideas regarding construction work will seek pictures and articles to help them visualize construction details, needed materials, and other unknown information. When in quest of such data pupils may proceed directly to the card file in which they will search for one or more cards bearing the word "boat" and which in turn will direct them to certain pages in books, magazines, or clippings where appropriate ideas may be obtained. When the pupil has developed definite ideas as to what he wishes to do and how, he may proceed to develop a plan for construction.

This is frequently done on a mimeographed project planning form which calls for identifying information including the pupil's name, school, grade, teacher, period, etc., followed by spaces for the bill of material, cost estimate, questions regarding related information which he considers valuable, a space for a shop sketch, and sources of his information. This kind of form may be filled out by the pupil according to his ability and experience. The project planning form may then be examined by a student helper and the instructor who gives final approval prior to the beginning of construction work.

Other pupils may find it desirable to study a principle of science, art, or possibly read a book which is descriptive of industry. Again the card file should direct him to sources of information which will help him to discover the desired information. Utilization of reference books in this way eliminates the necessity of teachers writing information, project, or instruction sheets as has been done so extensively in past years.



Record keeping is important and can be handled largely by students under a shop management plan. A bulletin board is used at the Brockport, N. Y., High School to make records readily available.

Working together.—One of the most effective and promising methods of organization for providing social experience and learning in an industrial-arts shop promises to show considerable development in the coming years. For many decades it has been common to appoint monitors or a shop foreman who are given specific responsibility for clean-up, tool checking, or other similar routine jobs.

There is gradually emerging an understanding of the possibilities of a democratic personnel organization in which a pupil superintendent, and possibly an assistant superintendent, are in charge of shop management and personnel. Under them are foremen who are in charge of: (1) equipment and maintenance, (2) materials and supplies, (3) office management, (4) safety and hygiene, and (5) work inspection. Under each of these foremen one or more pupils are detailed to various phases of the foreman's work. Each member of the class is a part of the organization and responsible to one of the officers or, in the case of the superintendent, directly to the teacher. This distribution of management duties to all members of the class spreads the actual work so well that no pupil has to lose much working time.

As a rule, the organization is developed gradually from the beginning of the year through making promotions to foremanship and superintendency positions. Those who work under a foreman may well be rotated at frequent intervals. Foremen need to carry responsibility for at least three months in order to discover their potential leadership ability. Superintendents need a longer period in office before graduating to the advisory committee which works with the teacher in the perfecting of the personnel management organization.

This type of plan can be organized and developed by a teacher who is appreciative of the varying abilities of pupils and the need for leadership and followership experience.

Outside preparation.—If industrial arts is effective, many pupils will carry the shop interest to out-of-school activities. Repair jobs at home, leisure-time activities, and the home workshop interest pupils. Teachers will do well to encourage such activities.

Schools loan books to pupils. There is no reason why every school shop should not operate a tool-loan service to pupils who are interested in doing construction work at home. Either single tools or small kits of tools can be loaned. Small projects constructed at home can be brought to school for display and grading. This creates some additional incentive.

With very little stimulus, pupils can be interested in visiting small industries, collecting industrial bulletins, reading house organs and books related to indus-

(*Continued on page* 57)

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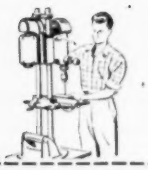

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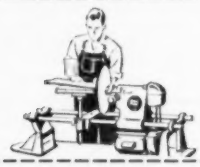

Imagine a shop so completely adaptable that it can be all lathes or all drill presses one period, and the next period a complete assortment of different power tools — *with changes requiring less than a minute per machine.* A shop that can be fitted quickly and easily to the progress and projects of any group, beginners or advanced.

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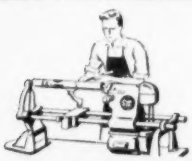

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Learning in the Auto Shop

By Ray F. Kuns

That four-wheeled gasoline-powered vehicle known as the automobile has affected life in these United States like few other modern developments. Herewith are given the fundamentals in automotive shop training which make learning significant. Ray F. Kuns is the author of standard automotive texts, an auto-mechanics instructor for many years, and a consultant on automotive training who makes his headquarters in Cincinnati, Ohio.

ABOUT a year ago the automotive industry celebrated its fiftieth year of service to the American public. The romantic and utilitarian appeal of the automobile to the rank and file of Americans stands in a field apart. No other assembly of nuts, bolts, springs, wheels, tires, gears, steel, copper, glass, wire, and rubber has ever impinged on our consciousness with anything like the force of the device known as the automobile.

The development of automotive education in schools began before the advent of World War I. The necessity for the introduction of extensive training programs during two world wars gave impetus to the work and was largely responsible for its establishment as one of the important activities in the shop program in our schools and it continues to exert a tremendous pull on the youth of the nation.

Two Types of Programs

Automotive work may be organized on an industrial-arts basis as a one-semester or two-semester course in the junior-high or senior-high school. When so offered, it is usually given as an informational course having general values to any user or owner of an automobile. In the field of science, the automobile with its many and varied components offers a very real source of interesting and helpful instructional units and excellent hooks on which to hang general-science information. The same can be said with reference to a course in physics and to a lesser degree in chemistry. Light, heat, sound, friction, levers, gears, pulleys, etc., can be made fascinating studies indeed when applied to the functioning of the components of the automobile.

Vocational courses may be offered at various levels. Well-trained helpers can be provided for specialized fields such as brakes, engines, service-station work, and other areas. Others can be trained to enter employment as an auto mechanic at the apprentice or beginner level.

The vocational high-school graduate needs to have certain fundamental knowledges such as ability to select and use wrenches, ability to maintain cleanliness, familiarity with modern test and diagnostic equipment, and proven ability to use currently approved servicing equipment and methods. Supplementing these skills is the technical knowledge backlog. This includes such things as knowledge of the four-stroke cycle principle, how oils are refined, tested, and graded, fundamental differences in fuels and how fuels are treated, compression ratios, the meaning of friction and its many applications throughout the automobile, the functioning of the hydraulic drives in common use, the effect of heat on natural and synthetic rubbers, the intricacies of the functioning and the theory of the electrical units, the methods of handling anti-freeze compounds, as well as many others.

Over and beyond the vocational high-school type of program has come the technical-institute level of automotive education. The product of this type of training should be wholly familiar with the science involved in the field and also at home with the tools and equipment in any shop or department in the automotive field. The graduate should be able to do a highly technical job in a wholly competent manner.

Teacher Competencies

The teacher should have adequate college training in the automotive areas as well as shop experience. Attendance at the clinics offered by many automotive and equipment manufacturers is highly desirable.

A common hazard of the teacher-mechanic is to become so surrounded by the demands of his immediate task that the industry as a whole and service in particular move out ahead and leave him more or less stranded with obsolete tech-

The modern service floor in the auto shop of the Central High School, Cincinnati, Ohio, has a complete complement of modern scientific test and diagnostic equipment. Students can apply here the principles which they learn in the laboratory and classroom of auto functioning.

niques. The closer a teacher comes to service of current automotive creations, the easier it is for him to be on the lookout for new teaching methods and materials.

Tools and Equipment

Much of the success of the auto-mechanics course, as far as shop routine is concerned, is determined by the organization of the job with reference to tools, equipment, materials, and supplies, and the ability of the instructor to maintain it in a neat, orderly condition.

The nature of the automotive equipment used to furnish the shop is determined almost wholly by the nature of the program of instruction. If it is strictly an owner-driver informational type of shop set-up, then the equipment should be quite varied and run through the entire list of automotive components which go into the modern automobile. In such case it is recommended that most of the equipment be from the so-called "big three" since the equipment used in these cars is representative of the industry as a whole. It would, of course, be necessary to step out into the other portions of the field to select some specialized units which are not represented in the popular-priced cars.

It is of utmost importance, however, to know that the equipment which is on hand is in usable condition, that it is properly maintained, and that the student assigned to work on it is going to gain the desired information and knowledge because the component is maintained in a complete and workable condition. For instance, if the instructor is kept busy explaining how a thing would work if parts were not missing, the teaching is definitely negative and perhaps worse than no teaching. The industrial-arts course should concern itself with correct technical instruction throughout the entire range of automotive components. The time given, however, to actual instruction is usually so short that if students are expected to bring in cars from the road, clean them up, and prepare them for access to the parts at fault, they are ofttimes in a position where they have little or no time remaining for careful diagnostic consideration of causes of trouble and methods of repair.

When it comes to the question of setting up a shop which deals with any of the highly specialized courses for vocational- and trade-school students, the exact type of unit which is to be considered and the exact shop and test equipment required should be set up in the shop prior to any attempt at a general consideration of maintenance and repair service in a special field. (The fluid drive and torque converter type of hydraulic transmission is an example of a highly specialized course. There are many others as fuel systems, tune up, or body work, to mention but a few.)

Science classes dealing directly with the principles found operating in the automobile make the instruction significant for students.

The chief problem in setting up an automotive shop is the selection and maintenance of testing and servicing equipment and tools. Since work done is on the automobiles coming into the shop, only demonstration units for illustrating automotive design construction and repair methods need be supplied as part of the shop equipment.

Naturally, the automobiles brought in should require work in line with the type of training which is desired.

The scientific test equipment will run all the way from simple ammeters and voltmeters through the fuel analysis equipment, ignition test unit, head-light and brake-testing equipment, and even to the use of the car dynamometer.

Materials and Supplies

Fortunately, in most cases units on which the work and instruction are to be carried on come into the school on their own wheels. However, there is a considerable range of materials and supplies which must also be available. This includes gasket material, oils, greases, fuel, bolts, nuts, cotter keys, and a considerable range of parts which are more or less standard to the assembly and disassembly of any automobile. It certainly would not include special parts, for instance, the ring and pinion gear for a particular model of automobile. The store- or parts-room, of course, will need to have some system set up to secure such parts as may be required on short notice and for which payment may be exacted before the product leaves the school shop.

Records and Outlines

In any shop set-up there is a background of outlined material and records of former instructional efforts unless it is a new shop. Moreover, in his preparation for teaching, the instructor has probably been able to acquire a considerable quantity of this type of information and teaching help. Supplementing the teaching procedure outlines are the textbooks, the manufacturers' instruction manuals, the service-equipment-and-tools instruction sheets and books, and a considerable amount of reference material of one type or another. There should be a constant growth of the amount of teaching aids.

Preparation

Preparation for the daily classroom routine is buttressed by the range of experience and training which has been gained by the teacher over a period of years. In addition to this background, there must be a daily program of lesson preparation and outlining. Nothing can be quite so disastrous as the "turning-them-loose" procedure when engaged in by an automotive instructor with a group of 30 or more boys. In a very short time, nuts and bolts may be flying and certainly, when the next class comes along, many parts are going to be missing. When this happens the value of the instruction is of a very questionable nature indeed.

Accordingly the instructor should have each lesson well outlined, and should impart to the class, as a group, certain information in connection with daily textbook assignment and reference reading. This, however, is only part of the daily lesson, the other part being the actual experience with automotive com-

(Continued on page 55)

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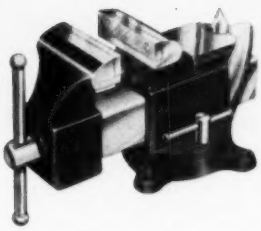

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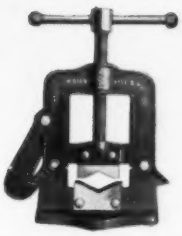

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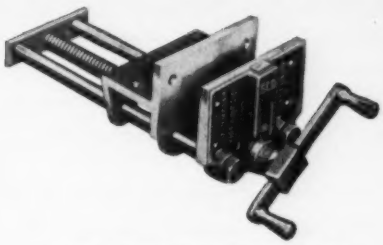
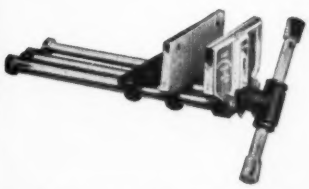
Columbian Malleable Iron HINGED PIPE Vises have self locking unbreakable hooks, tool steel pipe jaws, cold rolled steel screws and handles. Sizes for holding pipe from ⅛" up to 12". Every maintenance department should have one.



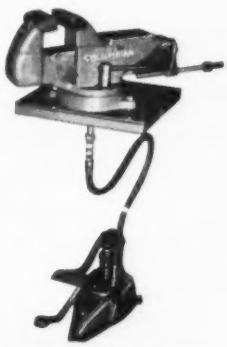
WOODWORKERS' VISES

Continuous Screw—Rapid Acting Columbian Woodworkers' Vises are finding increased uses in many plants particularly for the more ordinary types of pattern work. These durable low cost vises are sturdily built with jaw openings up to 12 inches.



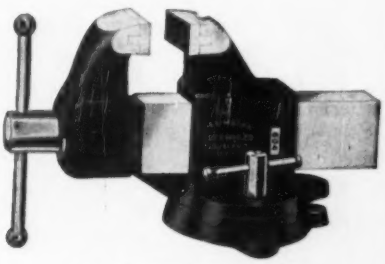
WOODWORKERS' VISES

Simple rapid acting mechanism. A slight turn of the handle engages threads of the nut and screw. A half turn tightens the vise to the work. Made in all popular sizes with jaw openings up to 12 inches.



HYDRAULIC VISE

Simple, two pedal foot control leaves both hands free. 3½" jaw widths and 6" jaw openings. Precision manufacturing and tested quality guarantee positive operation and dependable power. Saves time — speeds production — accurate work position.



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Columbian Malleable Iron MACHINISTS' VISES are guaranteed unbreakable! In addition to their exceptional strength, Columbian engineering has built into these vises the finest mechanical perfection and special features appreciated by users. Made in all standard sizes—3" to 8" jaw widths equipped with replaceable tool steel jaw faces.

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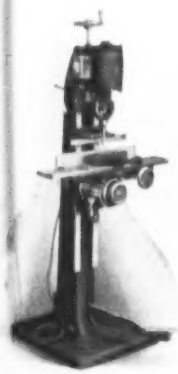
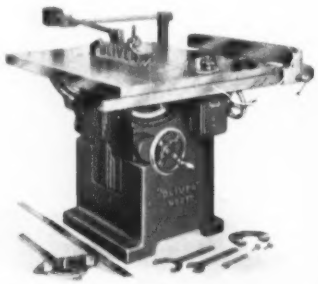
"Oliver" machines are designed and built for industry. They also meet the needs for thorough, safe student training. They're easy to operate, and have the latest safety features. Students soon learn to set up an "Oliver" accurately. Self-locking devices keep machines in perfect adjustment. The machines shown here are but a few of a complete line to make your efforts most effective.





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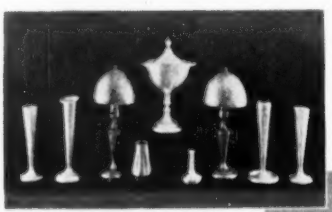
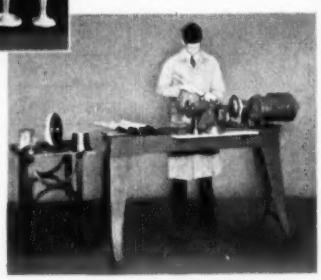


METAL SPINNING LATHE
— helpful and valuable in any shop!

You can spin beautiful as well as useful vases, cups, trays, etc., from pewter, copper, bronze and other sheet metals. The "Oliver" No. 159-M Metal Spinning Lathe is precision built with extra heavy bearings to withstand severe service. Has ball-bearing variable-speed motor-driven headstock and live tail center. Swings 12" diameter, 24" between centers. Lathe can also be used for turning wood and soft metals.



Make Woodworking Challenging!

By Heber A. Sotzin

Projects are not ends in themselves, but should develop students' skills in everyday problems and their appreciation of their environment, the author contends. With this in mind, he advocates more cooperative group projects, and offering girls as well as boys industrial-arts experience. Every effort should be made to stimulate interest, he adds, by the use of teaching aids, demonstrations, contests, etc. Professor Sotzin is head of the Industrial Arts Department, San Jose State College, San Jose, Calif.

These winners in a recent San Diego, Calif., City Schools Model Yacht Regatta demonstrate the author's point that contests heighten student interest in woodworking projects. This photo was submitted by William B. Steinberg, coordinator of industrial-arts training in San Diego Schools.

WOODWORK is the most frequently taught subject in the industrial-arts field in the schools of this country. The reasons for its popularity are fairly simple.

First, almost everyone has had some experience with woodworking tools; *second*, wood is one of the oldest and most abundant materials used for constructional purposes; and *third*, its versatility is almost limitless.

Wood holds man in his cradle, his play-pen, his bed, his home, and finally provides his last resting place. It shelters him, keeps him warm, gives him a livelihood, provides physical comforts, aids him in exploring unknown and remote places, and in countless other ways has assisted man to progress socially and to attain a high state of materialistic culture. Each kind of wood has its own characteristics. White pine is used to build Colonial houses and patterns for a multiplicity of metal castings; ash and hickory for baseball bats and skiis; cedar for shingles and lead pencils; mahogany and walnut for fine cabinets and furniture; redwood burl for bowls and candle-sticks; teakwood for tables and floors; maple for floors and bedsteads, etc.

Choosing Good Projects

The modern shop teacher must be an educational philosopher as well as a practitioner. First he must determine the major goals or objectives of his course, and the subject-matter content. Then he must decide what activities and experiences his students will need in order to attain these goals. Since industrial-arts activities are predicated on a philosophy of "learning by doing;" the projects selected, on a guided and directed pupil-teacher choice basis, should:

1. Have a specific purpose and use.
2. Arouse and stimulate pupil interest.
3. Induce reflective thinking and sound planning.
4. Challenge the pupil's ability and ingenuity.
5. Include new elements of learning and new experiences.
6. Satisfy the requirements of good design and construction.
7. Reflect modern technology and its functional applications.
8. Involve manipulations and related information within the range of pupil ages and abilities.
9. Be free from hazards and dangerous operations.
10. Be moderate in cost and within the financial means of the pupil and school.

Group Project Concept

Since "manual training" was first introduced into public-school work, the ultimate aim of many teachers has been finished, individual projects. Frequently, the project was not a means to an end but an end in itself. With an improved philosophy in general education and industrial arts, the individual project of the future will be minimized; and more group projects, with or without variations to fit individual needs, will be employed. Activities and experiences will be offered for girls as well as boys, and will be centered around such major endeavors as:

1. Health and Safety.
2. Food and Utensils.
3. Clothing and Textiles.
4. Shelter and Housing.
5. Power and Speed.
6. Transportation and Travel.
7. Communication and Records.
8. Vocation and Livelihood.
9. Avocation and Leisure.
10. Democracy and Democratic Living.

Herein with problems which concern everyone, opportunities are afforded to work in a single group or in several groups and learn what cooperative effort, sharing, evaluating, interpreting, and democracy really mean. The manipulative experiences will be supplemented by a variety of teaching aids—oral, written, visual, experimental, investigatory, etc.

Stimulating Interest

Pupils need good examples and models, rather than criticism. Examples of good design and workmanship, together with demonstrations of good techniques are essentials of good standards of teaching. The standards to be attained must be considered as relative; depending on the age, grade, experience, interest, and physical and mental development of the pupils comprising a class.

One of the major tasks of a teacher is to motivate his pupils—stimulate their interest. Mental and physical fatigue, and dislike for school are caused chiefly by activities in which pupils see or feel little need, pleasure, or satisfaction. Hence, study materials must be chosen wisely and carefully. The efficient teacher, therefore, will have on hand a large amount of suggestive materials from which pupils can choose, select, compare, and evaluate. These materials take the form of books, magazines, cata-

(*Continued on page 23*)

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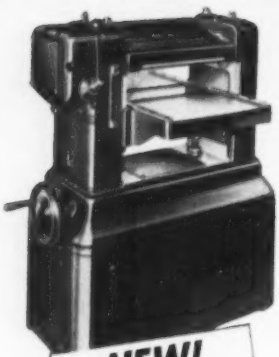

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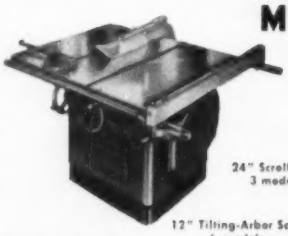

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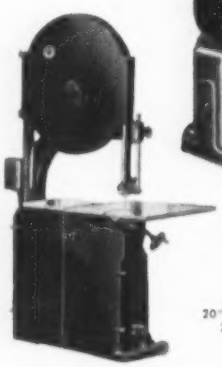

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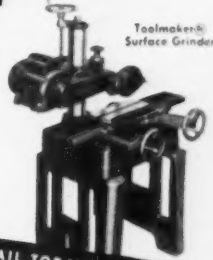

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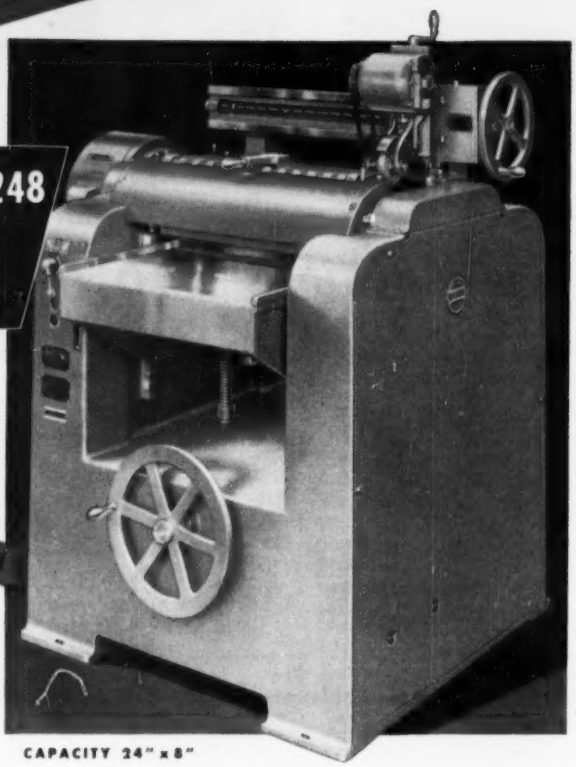

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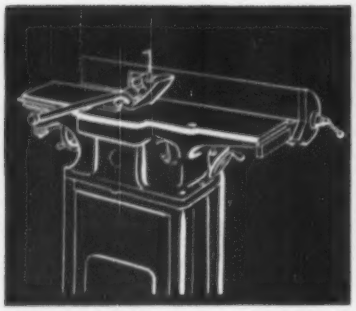
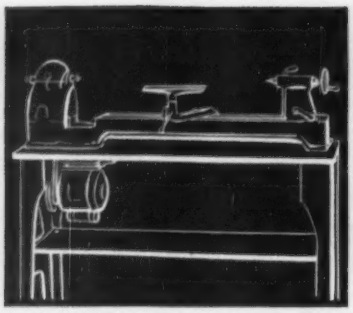
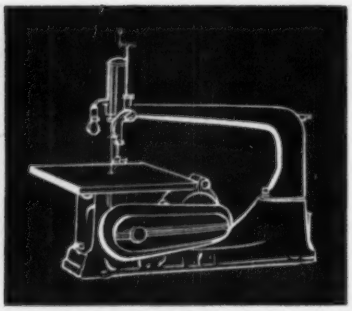


6" Jointer For handling narrow strips, planing thin stock, surfacing, and beveling, as well as jointing. Its versatility alone makes this machine a good investment. Dual Purpose Guard speeds planing, protects operator.



Four Speed Lathe Built chiefly for wood turning, cast iron head stock and double row pre-loaded spindle bearings make it an ideal machine for metal spinning. Give your students the advantage of Walker-Turner design!



24" Jig Saw Four operating speeds, easily and quickly adjusted blade tension. Designed to meet the needs of industrial arts and vocational schools. Cuts wood, paper, fibre, plastics, bone, all kinds of sheet metal.

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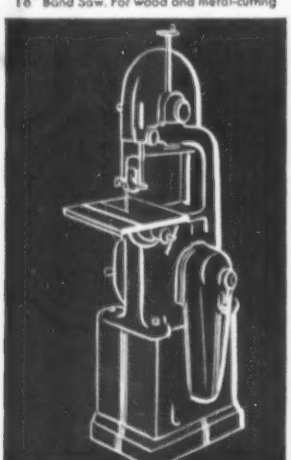
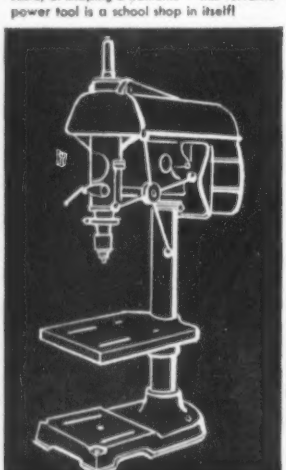


15" Drill Press Use it for drilling, sanding, mortising, grinding, spot polishing metal surfaces (of machines), removing rust and scale, or shaping ornaments — this versatile power tool is a school shop in itself!



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(*Continued from page* 17)

logues, pictures, sketches, drawings, films, slides, finished projects, lesson plans, and many other teaching aids. In addition, visits to stores, museums, and exhibits are recommended.

There is no standardized procedure to motivate pupils. Many teachers have developed unique procedures. For example, one superior teacher plans many of his suggested projects around holidays and seasonal events, such as: (1) Lincoln's Birthday, Valentine's Day, Washington's Birthday, Easter, Memorial Day, Thanksgiving, and the Yuletide; and (2) winter sports, hunting season, spring gardening and planting, camping season, etc.

Others employ such major activities as a model yacht regatta, (see photograph) a kite contest, an airplane contest, a bird-house contest, etc. The success of any teacher endeavor depends on his enthusiasms and resourcefulness. It is the individual teacher who must supply "the motive power" through his ability to impart knowledge, arouse and sustain interest, provide the necessary and proper tools and equipment, give skillful demonstrations, and possess "the know how" to lead the way.

The Lesson Plan

A good lesson plan is simply an outline of an intelligent procedure. A good procedure saves time, effort, and material, and leads the worker in the proper direction. At the outset the instructor should provide examples of good lesson plans, but as the pupil gains experience he should outline his own plan under the guidance and direction of the teacher. A sound lesson plan should include the following items: (a) name of project, (b) purpose of project, (c) sketch or drawing of project, (d) materials required together with approximate cost, (e) tools required, (f) procedures of construction and in sequential order, (g) major principles involved relative to materials, design, construction, finish, etc., (h) selected references, and (i) evaluation.

Instruction sheets (operations, information, and assignments) should be used as a handy guide to supplement demonstrations, explanations, and class discussions.

Example of a Group Shop Project

The Christmas holiday season presents a need for receptacles for fruits, nuts, pastries, candies, sandwiches, and other food commodities frequently served to guests and visitors. Hence, the necessity for a serving tray is evident. It may also be made as a very acceptable gift for a member of the immediate family, a close friend or relative. This project falls into the previously mentioned category "Food and Utensils."

Here the members of the class worked as a group and produced enough trays so that each pupil who participated received a tray when the project was completed.

Name of Project: A Turned Wooden Tray. (See illustration.)

Purpose:

1. To introduce a variety of rare woods.
2. To construct something useful and beautiful.
3. To integrate previous experiences in mechanical drawing and applied art.
4. To do turning involving the use of a face plate.
5. To do turning to a high degree of accuracy involving a metal template.

Integrations:

English—Library research, spelling of new and old terms, class discussions, written reports.

Mathematics—Measurements, calibrations, lathe speeds.

Natural Science—Wood finishes, uses of hard woods, seasoning of lumber.

Social Science—Geographical location of hard woods, historical significance and uses of various hard woods.

Art, Design, Drawing—Technical sketches, development of six variations of profiles of turned trays.

Occupational Information—Role of wood-turning in industry and its significance in modern living.

Evaluation—Constructive criticism of designs and drawings, checking of templates against drawings, checking of templates against turnings, checking of finishes.

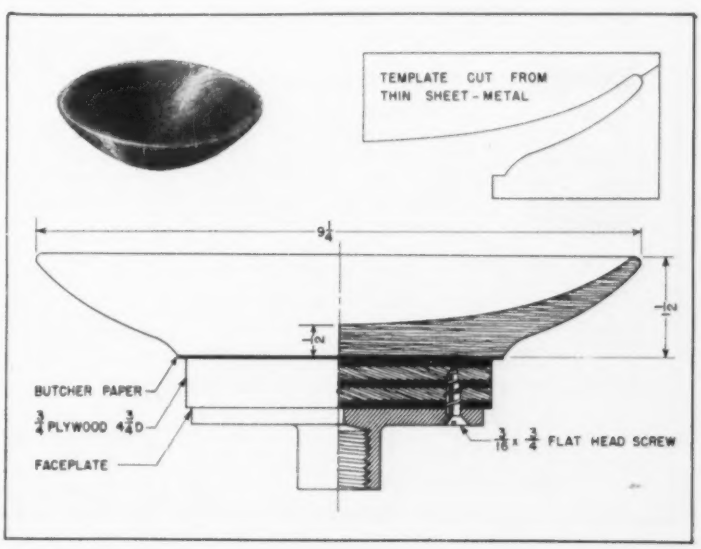
Upon completion of the work the class planned and arranged an exhibit in the school library in order to share the results of their study and experiences with others.

The trays were artistically arranged and integrated with several large circular trays constructed in the metal-spinning and ceramics classes, to show the relationship of wood-turning on a face plate with spinning metal and of throwing clay, in various shapes, on a potter's wheel.

Role of the Teacher

The foregoing plan and procedure may sound relatively simple, but success was due primarily to a versatile and resourceful teacher. His activities consisted of:

1. Motivating the students relative to a functional project and various possibilities open to them.
2. Showing kodachrome slides, drawings, sketches, magazine pictures, photographs, and models of trays previously constructed.
3. Reviewing text materials on wood-turning.
4. Reviewing and constructing the project himself prior to demonstrations.
5. Demonstrating and stressing the necessity for accuracy in turning to a metal template.
6. Discussing and demonstrating proper finishes for various hard woods selected.
7. Assisting the students in a constructive evaluation of the project and determining the grades of individual students based on (a) design and drawing, (b) neatness and accuracy of turning to a template, and (c) decoration and finish.



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- ☐ How a Hand Saw Cuts
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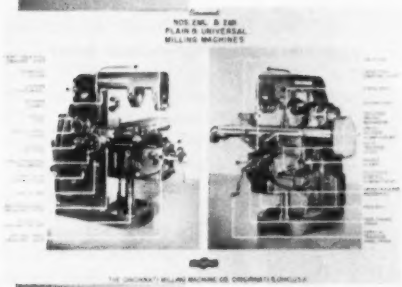
Principles of Centerless Grinding . . . No. G-503-1
General Catalog . . . No. M-1684
Look Sharp at Your Cutters . . . No. M-1657-2
Milling Machine Practice . . . No. M-773-1



Functional diagrams for a number of machines will be sent to school shop instructors on request. The diagrams, enlarged photos indicating the principal units and controls, are useful for classroom discussions. They are available for the machines listed below. Tables of leads and index tables, mounted on cardboard 14" x 18" for use with CINCINNATI Dividing Heads, are also available. If you are interested in information about two 16 mm color movies, "Highway to Production," and "Age of Precision," write us.

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Organize Machine-Shop Learning

By John T. Shuman and L. H. Bardo

The teacher's problem, say the authors, is to "devise a pattern of organized learning in his shop, suitable to a group of boys of different abilities." They stress the importance of fundamental principles and their application by the student, and the need to keep accurate records of which several samples are included. They express their debt to many teachers who contributed ideas. Mr. Shuman is Director, Vocational and Adult Education, Allentown, Pa.; and Mr. Bardo is head machine-shop instructor, Williamsport, Pa., Technical Institute.

TEACHING may be defined as "the organization of learning." For example, when we take on a pupil, we provide him with certain facilities consisting of a suitable shop or laboratory, machinery and equipment, tools, materials to work, textbooks, and assignments. He is expected to do the jobs and assignments; as one is finished he goes on to the next. Clearly, then, the teacher is paid to organize the student's learning effectively. His problem is to devise a pattern of organized learning in his shop, suitable to a group of boys of different abilities.

Efficiency Essential

Efficiency is essential to good learning. Have you ever watched an instructor get a group started when he knew exactly what jobs or projects he wanted each student to do; and when job sheets, blueprints, or other teaching aids and materials were available and ready? Or have you ever watched the instructor who decides only from day to day, or session to session, what jobs he will use?

The instructor who has his teaching materials organized, catalogued, and arranged so that he is ready for teaching; and who has his tool crib organized so that it functions automatically and he need not hunt for tools, can spend more time actually teaching and less time behaving "like a chicken with its head cut off."

Many machine-shop instructors, of course, exhibit many of the characteristics of their brothers in industry—job assignment sheets, progress charts, inventories, and checking systems all represent "red tape" which they do not have the time to work with. Unless the instructor comprehends and appreciates the value of organization he will never conscientiously develop such a program and he will not agree with this article. The techniques offered here are suggested only as a few of many that might be used. We fully realize, also, that all methods must be adapted to the local situation.

Trade Theory and Related Work

The problem of how best to teach trade theory and related information is always present. Perhaps there is no one solution to this problem, but several suggestions might be helpful.

One of the simplest and best ways to make certain that it is taught is to place pertinent questions on each job assignment sheet. (See page 27.) There are many forms of assignment sheets, but the sample presented serves as one illustration of how the theoretical problems can be made a part of the job assignment. The questions raised here can be used also in some of the group discussions. This system results in much theory being taught where it should be taught, specifically as it applies and when it applies to definite jobs, operations, and projects. The specific theory questions on each job assignment sheet make certain that the student's attention will be focused on that theory when he encounters the need for it on a specific job.

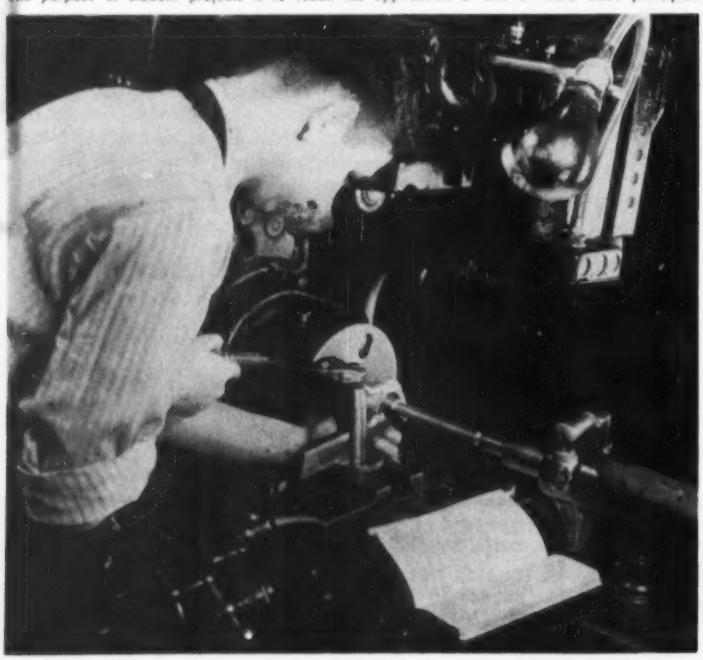
A Definite Time for Theory

When we get busy and production jobs create pressure in the shop, we are too inclined to miss a session of theory, and then another, and another. The way around this is to have a rigid time schedule for group meetings on theory. This same principle applies to the audio-visual program. If you have the equipment and films, a regular showing time is best, although flexibility should be the rule in the content and the teaching.

Having set aside a time for theory, how can the instructor be certain that he will teach progressively the theory he should cover? This will always remain something of a problem, but he can do two things:

1. Make theory a part of the course outline. Develop job or lesson assignments in theory and related work, and give them job numbers just as you would machining jobs. When their turn comes

The purpose of student projects is to teach the application of one or more basic principles.



LATHE WORK

Williamsport Technical Institute — Dept: Machine Shop

JOB NO. 3.03

JOB —Center Punch. PC-650

TOOLS AND EQUIPMENT—

Engine Lathe with collet or three-jaw chuck
6" Rule
Protractor
1" Micrometer

PROCEDURE—

Order material.
Mount material in collet or three-jaw chuck, face end and turn the diameter 3/8" long. Take off enough material to remove the octagon corners.
Reverse the material in the lathe and turn the long tapered end by using the taper attachment or the compound rest.
Turn the point by using the compound rest.

REFERENCES—

"How to Operate a Lathe," Pages 49 to 56, 12, 13, 113 to 115.
"Machine Shop Training Course," Volume 1, Pages 1 to 75.

THINGS TO LOOK FOR—

Be sure to notice that angle A is the angle with the center line, while the 30° point is the included angle.

QUESTIONS—

1. If the compound rest is used to turn the long taper, at what angle is it set?
2. At what taper per foot is the taper attachment set?
3. After hardening, why must the punch be tempered?
4. What is an included angle?

Pertinent theory questions are included on the Job Assignment Sheet to focus students' attention on them.

up, have the students do them in turn.

2. Set aside periods for definite kinds of theory and teaching. For example, suppose a teacher sets aside three one-hour periods each week for theory. He could allocate them as follows: one period for trade theory (including mathematics), one period for audio-visual aids and trade theory, and one period for blueprint reading.

Student Records Important

We must be able to tell at all times what a student has done in the shop, what machines he has operated, and what his progress has been. The traditional type of wall progress chart serves the purpose for an industrial-arts type of activity in which the student covers a limited or prescribed number of projects; but it does not lend itself well to accurate records on the vocational or adult level.

The following system may be used if you need accurate records of vocational-high-school or adult students:

1. Keep each student's work and record in an 8½" x 11" manila folder file. This folder can be filed by student number, or alphabetically by name. In it is kept all papers pertaining to this student. After he leaves school the folder is filed with the inactive group. At any future time the student's progress chart, hours, grades, etc., are all available for reference. This has proved a very valuable device in job placement work.

2. Keep a record of the student's time spent in the shop by the number of hours spent on the different machines. This record should be kept daily and totalled at the end of each month. Keeping this record on the basis of machine tools operated eliminates a lot of fussing about operations, projects, etc., and means more when presented to an employment manager. Many examples of record forms may be found in the current literature dealing with shop teaching, but it is expected that each teacher may prepare a suitable form to meet his particular needs. (See sample below.)

3. Keep an individual progress chart on the student. The individual progress chart has many things to recommend it. It can be filed in the student's folder and become a part of his permanent record, it can be sent with the student should he be transferred into other shop departments, and it enables the course to become really individualized in that jobs within the student's field of interest or range of ability can be selected and listed as his own custom-made course. The use of the individual progress chart also permits using a master outline of jobs, and breaking them down into units for different purposes. (See sample on page 31.)

4. The theory jobs we have mentioned, the audio-visual programs, as well as the regular shop jobs should all be listed on the progress chart and given job numbers.

5. A decimal system for numbering jobs is usually easier and more efficient.

Maintaining Standards

Three problems have always been present in good school machine shops:

1. How to have different instructors maintain good standards of workmanship?

2. How best to teach inspection techniques?

(*Continued on page* 31)

Employers want to know how much time students have had on various machines. This form serves this purpose and helps the instructor as well.

NAME _____ MONTH _____ SHOP _____

DATE	ABSENCE	BENCH WORK	DRILL PRESS	ENGINE LATHE	SHAPER & PLANER	MILLING MACHINES	GRINDING MACHINES	HEAT TREAT	TURRET LATHE & AUTOMATIC SCREW MACHINES	PRODUCTION CONTROL & INSPECTION	DIEMAKING	TOOLROOM LATHE WORK	

TOTAL HOURS

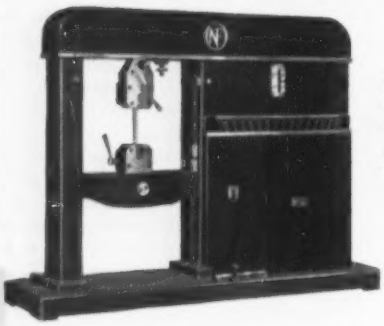
	EXCELLENT	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	FAILURE
INSTRUCTOR'S RATING	5	3	2	0	-5
QUANTITY DONE					
QUALITY DONE					
ABILITY TO LEARN					
DEPENDABILITY					
SAFETY HABITS					

DAYS ATTENDED _____
DAYS ABSENT _____
DAYS BELONGED _____
AVERAGE GRADE _____
INSTRUCTOR

The Newest

NATIONAL FORGE

UNIVERSAL TESTING MACHINE



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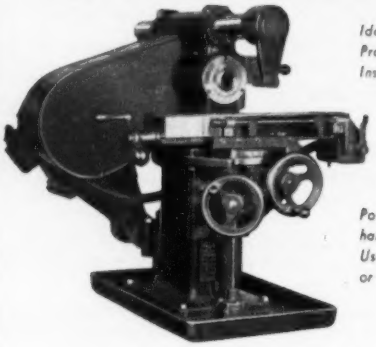

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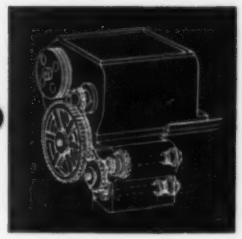
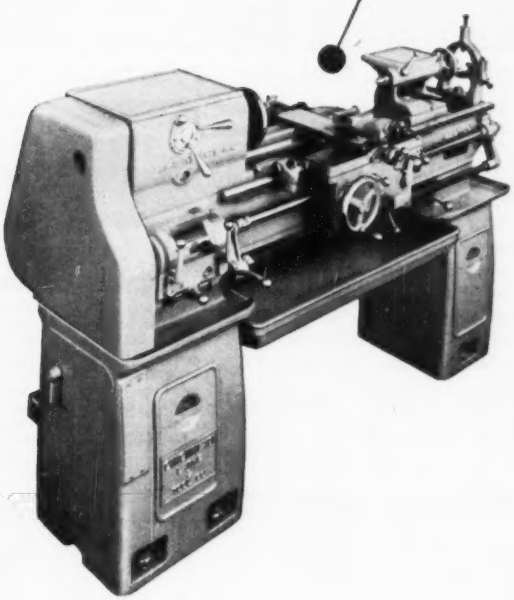
quick change artist



Reposition just 3 parts

Set up only two additional gears

from English to metric thread-chasing in about ten minutes*



Your students can learn to cut metric threads without old fashioned pick-off gears when you provide them with Cincinnati Tray-Top light duty engine lathe. Just three straightforward steps change Tray-Tops from English to metric thread chasing over the full range of 48 threads and feeds through the standard quick-change gear box—in a matter of minutes. The all geared head provides 12 spindle speeds—quickly selected by an exclusive 3-lever color-match dial control. gives students a wide range of problems they'll face in actual shop work. "Tray-Top" parking spaces above headstock and tailstock encourage good housekeeping.

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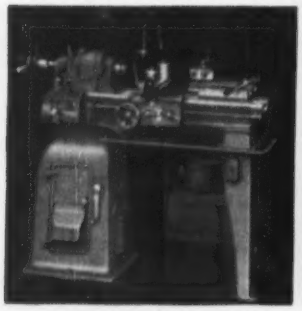
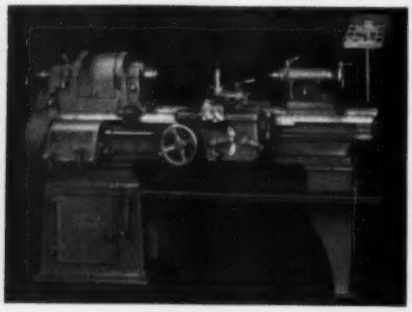
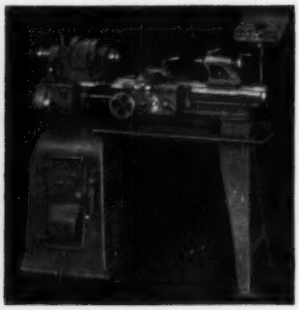


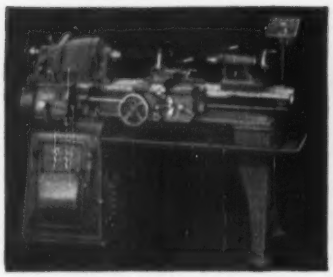
Series 1000 Turret Lathe



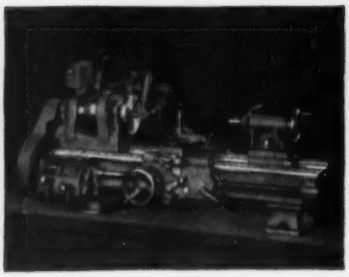
16" x 6' Toolroom Lathe



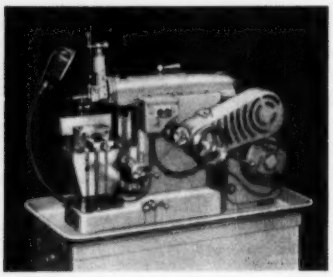
10" x 3½'-1" Col. Toolroom Lathe



13" x 5' Toolroom Lathe



9" x 3' Model A Bench Lathe



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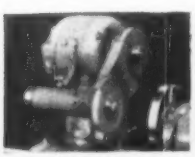

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Center and Follower Rests

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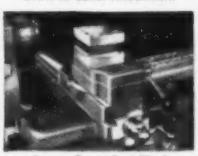


Square Turret Tool Block

Double Tool Cross Slide

Double Tool Cross Slide

COURSE OUTLINE AND PROGRESS RECORD
All Students

Williamsport Technical Institute — Dept: Machine Shop

Students Name

Job No.	Visual Aids or B/P No.	Job Name	Time or Day
1.01		Information To New Students	
1.02		How To Make Out Daily Time Records	
14.101	M-101 S-101	The Steel Rule	
14.124	M-124 S-124	Cutting Threads With Taps and Dies	
14.125	M-125 S-125	Scraping Flat Surfaces	
14.126	M-126 S-126	Fitting and Scraping Bearings	
14.127	M-127 S-127	Reaming With Straight Hand Reamer	
14.128	M-128 S-128	Reaming With Taper Hand Reamer	
14.130	M-130 S-130	Laying Out Small Castings	
14.131	M-131 S-131	Fundamentals of Filing	
14.137	M-137 S-137	Sawing An Internal Irregular Shape	
14.139	M-139	The Proper Way To Use A Hammer	
14.140	M-140	The Proper Way To Use A Wrench	
14.141	M-141	The Proper Way To Use A Hacksaw	
14.142	M-142	The Proper Way To Use A Chisel	
14.143	M-143	The Proper Way To Use Pliers and A Screwdriver	
14.144	M-144	The Proper Way To Use A Punch	
1.05		To Learn To Use The Steel Rule	
13.01		Common Fractions	
13.02		Common Fractions	
13.03		Test On Unit 1	
13.04		Decimal Fractions	

An individual progress chart is one of the most useful of all records, the authors say.

(*Continued from page 27*)

3. How to operate a practical system of production control?

Actually, these three problems are related to each other, and the partial solution of any one helps solve the other two. The device worked out by Lynn Harlan, machine-shop instructor at the Williamsport Technical Institute, points the way to a possible solution of this problem. (See bottom of page.)

A production-control and inspection department is organized as an integral part of the machine-shop instruction program. Students are assigned to it just as to any other department. It contains the various precision inspection instruments and is completely enclosed and separated from the rest of the shop. It operates as follows:

1. Routine job sheets (about 55) covering all phases of construction, care, and use of precision instruments, and inspection of standard shop jobs, are used to teach the student the fundamentals of inspection work.

2. All jobs for the school district requiring machine-shop work are processed through this department. Here they are received with the necessary drawings and work requisition. The work order is made out by the student and the job routed through the shop.

3. When the job has been completed it is sent to the Production Control and Inspection Department for inspection. If it is satisfactory, it is delivered; if it does not pass inspection, it is returned to the shop department in which it was produced.

4. Standard shop projects do not originate here, but they are all inspected here. This procedure makes reasonably certain that all instructors will enforce minimum standards of workmanship, giving them the initiative in the selection and starting of projects. Also, to have the Production Control and Inspection Department initiate all projects would overburden it with paper work.

Thus, production control and inspection instruction are coordinated with the rest of the shop instruction. Not only are the shop standards controlled, but inspection becomes a realistic and responsible process to the student.

If you have read this article thus far, it is possible that you are somewhat disappointed at the little discussion of concrete jobs which might be used in a course. But we would like to point out that the suggestions made here *are* specific and concrete *if applied to specific items and jobs*. We believe that the problem of teaching-improvement is fundamentally a problem of organization, and the application of fundamental principles. If you think about method on this level, you will be surprised how many of the other problem situations will be improved.

Work order used by Production Control and Inspection Dept., Williamsport Technical Institute.

Date _____ Williamsport Technical Institute, School District of the City of Williamsport — Job No. _____

PRODUCTION CONTROL AND INSPECTION

MACHINE SHOP — WORK ORDER

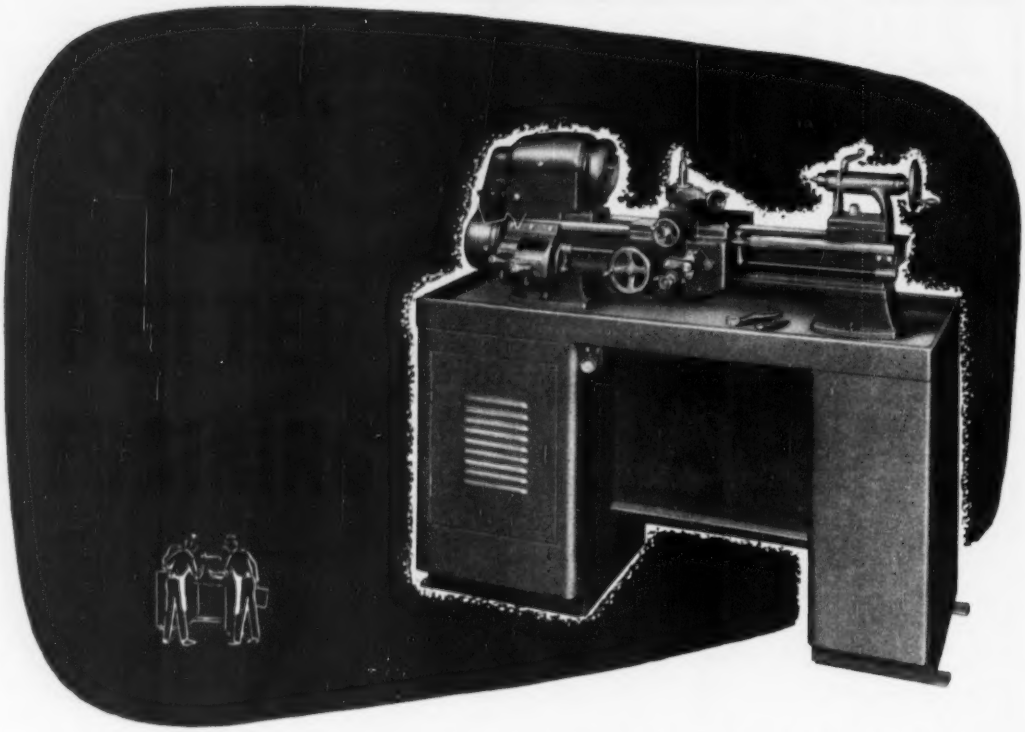
Job Assigned To _____ (Instructor) Rec'd. From _____ (Dept.) _____ (Instr.)

Part Name _____ No. Pieces _____ Drawing No. _____

Operation _____

INFORMATION OR INSTRUCTIONS

Pieces O. K. — Pieces Scrap — Pieces Rework — Inspector



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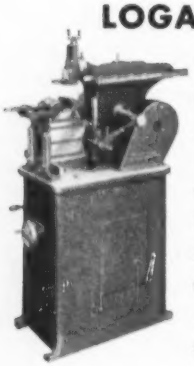
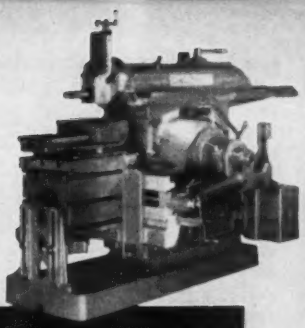
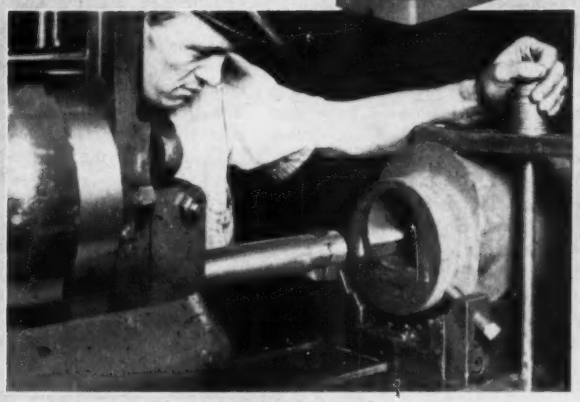


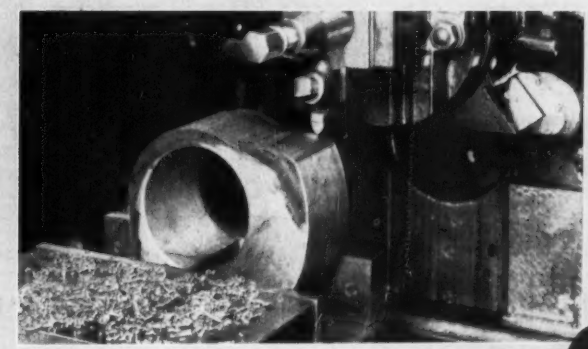
brings to the school shop the capacity, precision and versatility that make it a widely used industrial tool. Powerful 8½" stroke. Six automatic feeds in either direction, from .002" to .012". Designed for safety.

Use a SHAPER

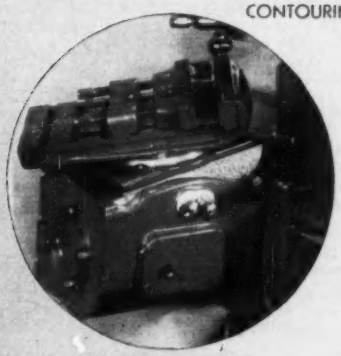




INTERNAL SHAPING



CONTOURING



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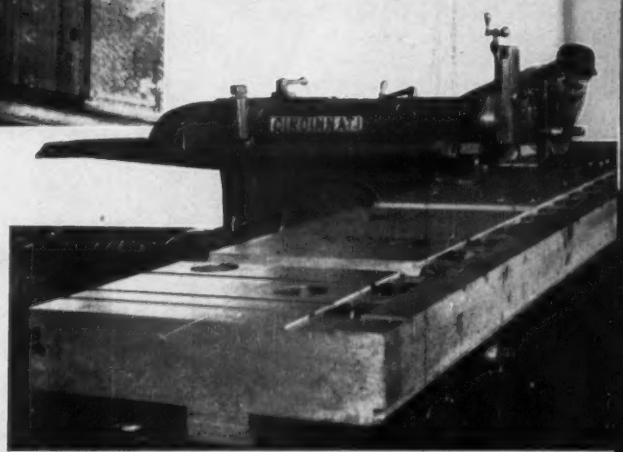

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Diamond Dust

Abrasive comments from that doughty Scot, Tom Diamond, former head, Department of Vocational Education, University of Michigan, Ann Arbor.

Gadzooks! The Gadfly

WHEN the Great Architect finished His task of creating the universe, He pronounced it to be good. However, after He had rested, He set about the job of creating Man. From the evidence we observe around us, He apparently wearied at the latter task as man's shortcomings are many. In His wisdom, He recognized the faulty results as He observed man's tendency to postpone action on those activities, which, while manifestly His responsibility, were not in harmony with His immediate interests.

In order to correct this condition, He conceived the idea of creating the common gadfly. Now this insect derives its name from its prominent proboscis which it wields with abandon when occasion demands. It seeks out its victims and drives its proboscis — or GAD — deeply and viciously into the anatomy of those it is pleased to favor with its attention.

As a result of these attacks, the victim is stimulated into vigorous action, and begins to look around for an outlet for his energy. The energy may be expended on swatting the fly or kicking the chair which stands near by. However, if proper direction is given to his efforts, it is conceivable that some of the tasks which he has been neglecting may receive attention.

Up to this point we have been considering the activities of the Gadfly, which wings its way merrily hither and yon, seeking whom it may annoy. But we have human gadflies as well who make life miserable for the sluggard. The little woman at home acts in this capacity on occasion. She stimulates friend husband into frantic efforts to take care of the countless chores which are common to every well-regulated household.

Then there is the school supervisor, whose whole aim in life appears to be to obtain better results in the area for which he is responsible. As one means toward this end, he is anxious to have his teachers become familiar with the current professional literature. However, some teachers take a dim view of reading anything but the funny page in the local newspaper, and, if they are to benefit from the expression of others in their field, they must be stimulated. There are a few who will respond to a kindly suggestion, but there are others who must have the gad plunged deeply into their hides before they will react as they should.

Then too, there are times when teachers are asked to submit reports on one or another of their numerous activities. Some teachers have conceived the quaint notion that these reports were devised merely to assist them in filling up their leisure time. And so we hear them complain that they cannot do justice to their teaching because they have so much secretarial work to do. Because of this dissatisfaction, the report which was due on the first of the month is mailed on the fifteenth, and then only after those who need the reports have indicated their displeasure by sending second or third requests for it. As these requests are not always couched in the most tactful language, the distaste of the teacher for the job increases in direct ratio to the number of requests required to get action.

Here again the supervisor is compelled to assume the role of the gadfly. He jabs the teacher in a tender spot and hopes for a favorable reaction. When this fails, he returns to his task and drives his gad a little deeper, until finally the poor teacher in desperation does precisely what he could have done before the report became overdue.

Other occasions might be mentioned in which the gadfly is called on to perform his function. However, the two presented here serve to illustrate the fact that some teachers are dilatory in the performance of their duty. One of the responsibilities of the supervisor is to see that certain duties are performed by his teachers at certain times. That he occasionally becomes disagreeable about some of them is not surprising. In many cases, the teacher's failure to recognize that what he is asked to do has been requested for a specific purpose led to the introduction of the gad.

As a rule, friend supervisor is a kindly soul, who wishes to live at peace with his fellows, but he is cast in an unenviable role. The frailties of man, and particularly the man teacher, drives him NUTS, and he reverts to the position of the frisky little gadfly, whom the Good Lord designed to overcome the weaknesses of His original creation. Have pity on him, he is merely trying to fulfill a function for which the gadfly came into being.

Woe is me! Who wants the job of a supervisor anyway?

Keep This Issue for Reference!

This number of SCHOOL SHOP has been prepared especially for ready reference purposes. The directories of suppliers and of officials will come in handy during the months to come. Keep this number on hand as it has the only inclusive directories available.

Jigsaw Jones

Aaron Adams, High School, Marion, Indiana

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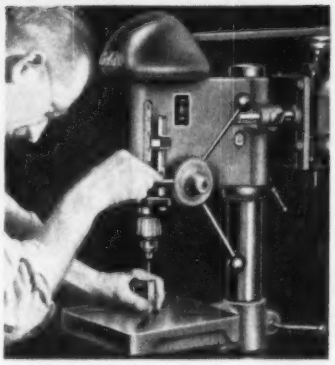

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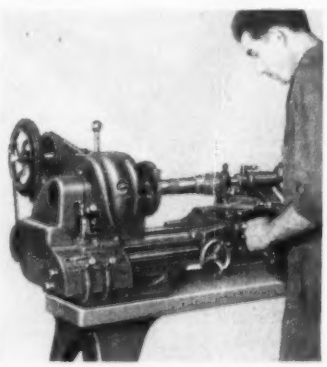

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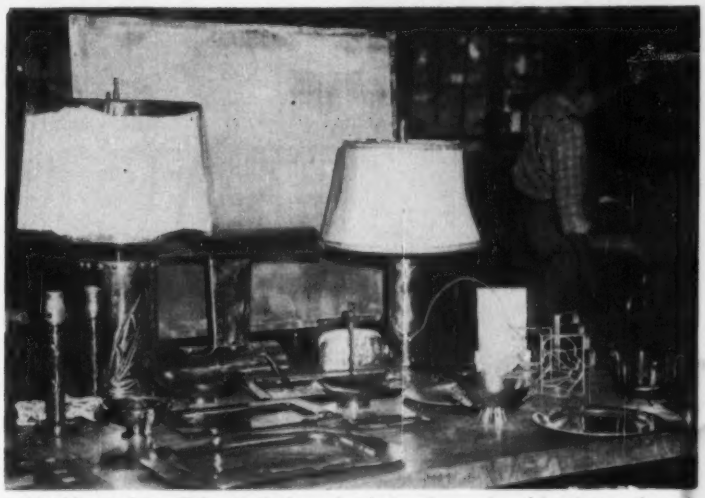
Stimulating Learning in Metalworking

By Dewey F. Barich

"The teacher must be interested and enthusiastic" if his pupils are to become interested, the author says and proceeds to give some very good suggestions to this end, as well as on the general subject of effective instruction in metalworking. Group discussion and demonstrations are preferred to lectures. Dewey F. Barich is head of the Department of Industrial Arts, Kent State University, Kent, Ohio.



Metalshop students will draw inspiration and enthusiasm from such model projects as these.

AN immediate consideration in the treatment of this subject is a common understanding of the terminology to be used in the discussion. Metalwork, for the purpose of this writing, will carry a broad, general meaning, including such terms as bench metalwork, ornamental iron work, artistic metalwork, art metalwork, tin can craft, metal foil work, etc. Also, the basic philosophy will be that of industrial-arts education—that is, no particular stress will be placed on the acquisition of specific skills for vocational purposes.

It will be well to keep in mind, too, that teaching methods cannot be prescribed specifically for every teaching situation that may arise. This is true because of many factors that are involved: physical facilities, availability of materials, student interests, the teacher's preparation, the teacher's interest, and the philosophy of the school, to name a few. Therefore, the methods as discussed here should be interpreted broadly, and in light of the circumstances involved in a particular teacher-learner situation.

Obtaining Interest

One of the first considerations in the preparation to teach metalwork, or any other area of instruction for that matter, is *interest*. Interest in metalwork is not difficult to obtain because of the variety of metals and alloys, and the many manipulative tool processes involved. This makes possible a wide range of projects adaptable to a wide range of student abilities.

First of all, the teacher must be interested and enthusiastic about what he teaches. Enthusiasm is catchy and will go a long way to get a teacher over the "rough spots." Here are some of the ways to stimulate your own interest and enthusiasm. Attend professional meetings and exhibits—they are usually a source of inspiration. Have a good up-to-date library of your own—it is one of your important "tools." Good books and magazines in our work are becoming more plentiful. Publishers have generous free examination plans making it possible for teachers to see the professional books as they become available.

Get acquainted with a craftsman who makes his livelihood by doing metalwork. One of my most treasured friendships was with a silversmith with whom I had the good fortune to work and learn. There is something in such an experience that gives you a great moral lift and respect for fine craftsmanship—a respect that we cannot ever afford to overlook. It is one of the unique contributions our work can make to education.

Visit Museums

Visits to museums, too, can be very profitable to both student and teacher. A former industrial-arts teacher, and now a city supervisor, made a practice of taking his metalworking classes to a museum. Each student was encouraged to make a sketch of suitable projects he saw on his visit. This teacher had no trouble creating interest. There was always a waiting list of students anxious to get into his class. You can see that such a procedure would eliminate monotonous repetition of projects. Visits to fine gift shops and stores is still another stimulus to the imagination of teachers and students alike.

Providing for a variety of metalworking learning experiences calls for very careful and thorough planning by the teacher. It is essential that he analyze, from all the available source material, those particular areas of instruction within the metalworking field that best suit his objectives, his shop facilities, and his students' abilities. For example, for a particular course he may decide to provide instruction in ornamental iron work, copper, brass, and aluminum. He would then proceed to plan his instructional units to include the manipulative as well as the informational phases of these units of metalworking.

Need for Planning

Too much emphasis cannot be placed on the need for *planning*. Many of our teaching problems result from lack of planning. One of the essentials in planning is keeping records. Records to be useful must be simple, but complete and continuous. Provision should be made to show what each student has accomplished. The teacher's record, in addition to student grades, ought to include: inventory of tools and supplies, shop library records, an up-to-date and easily accessible file on ideas for projects, and an adequate supply of instructional materials such as assignment sheets, job sheets, and information sheets.

In many schools, material sales to students is the responsibility of the shop teacher. Adequate records are a "must" where money is involved. Finally, an over-all record should be kept by the teacher that shows "where we are" at any given time in a course. This is essential if the teacher is going to accomplish

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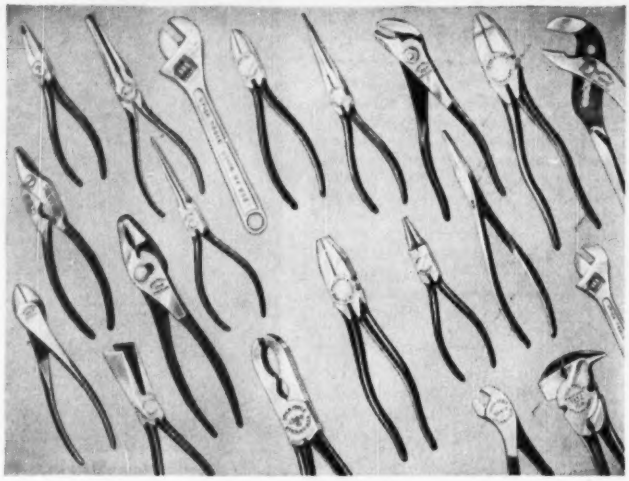
And... one other equation
...an axiom, in fact...



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the work which he has set out to do.

Delegating Responsibility

Every shop teacher has said at least once, "Yes, that is a good idea, and I know it ought to be carried out, but how can I find the time to do it?" You cannot do everything that needs to be done in a school shop if you have to do it alone. Therefore, you must make the best use of your students. A personnel system of some kind is another "must" in teaching metalwork. Here, again, the extent to which a student personnel system is organized and used depends on the circumstances. A beginning class of 35 students in metalworking would have a more elaborate student personnel system than an advanced class of 15 students.

In either case such important responsibilities as clean up, attendance reports, safety inspection, material control, bulletin board changes, shop library control, and any other responsibilities peculiar to a given shop situation can be delegated to students. It takes *planning*, *instruction*, and *follow-up* continually.

Methods

Here are a series of questions and answers about problems that may be classified as having to do with "methods." The answers are given in light of the assumptions made in the beginning of this article.

Question: What preparation do you make prior to giving a demonstration?

Answer: When a demonstration is given for the first time I work out a demonstration guide sheet which gives the tools, materials, and step-by-step procedure. This is not an elaborate, wordy lesson plan.

Question: Do you lecture to your class?

Answer: No. In teaching metalwork in a secondary school, I believe that class discussion and demonstrations are much more effective than lectures. Every effort should be made to keep class discussions limited to a maximum of 25 minutes. A shop is a place for manipulative activity and should be used as such. It is possible to keep class discussion periods short if they are well planned in advance.

Question: Have you reserved a space in which you lecture or demonstrate?

Answer: Yes. For demonstrations and class discussions, space should be provided where students can be seated in such a way as to provide maximum observation. Personally, I like a fold-away, bleacher-seat arrangement, or folding chairs.

Question: Do you present your lessons to the class as a whole, or to small groups?

Answer: Both. Basic operations such as laying out sheetmetal stock, silver soldering, annealing, spinning, etc., are given to the whole class. Follow-up demonstrations, I have found, are necessary, and these are given to small groups of individuals.

Question: What method do you use for presenting the related information aspects of your work?

Answer: I find that the use of assignment sheets is the most effective way to get related information to students. Reading assignments should be short and on a single subject or part of a subject, with a list of discussion questions (not too many) which will encourage concentrated thinking. When textbooks are used, it is important that they be of the type or kind readily understood by the students.

Question: How often do you give class tests? What type do you find most helpful?

Answer: I like short unit tests given frequently. Because of the time-saving characteristics, and because students usually like them, I use true-false, completion, and multiple-choice tests.

Question: Do you have shop rules which govern the actions of pupils? How do you impress these on each class?

Answer: I am not very receptive to the term "rules." I like shop policies formulated cooperatively with students that govern everyone's actions in the shop. It has been my experience that such policies are much easier to enforce because everybody is in on the enforcing.

Question: How do you deal with a student who is an idler?

Answer: In such instances I have concluded that I just did not know enough about the person. In our work we have a great opportunity to take care of "individual differences." It requires looking into all the factors affecting the student's behavior. I am reminded of an experience with a seventh-grade boy. I almost gave up trying to find something he could do until I hit upon the idea of having him as my "handy man." It worked! He was a happy boy and I made him responsible for some of the simple but essential jobs around the shop. Today, as a man, he is still a happy "handy man" working in a large apartment building in one of our mid western cities.

To get at what makes a boy "tick," sometimes I have had to visit his home. Often I have found the answer to why Johnny behaves like he does. Any shop teacher who really tries can do the same. Every student is capable of doing useful work if his interest is aroused and he receives the proper direction and encouragement. It is the duty of the instructor to see that he gets this.

Orderly and convenient arrangement of tools helps in efficient shop teaching.

Student forming bowl in art metal class, Hamilton High School, Los Angeles, Calif.

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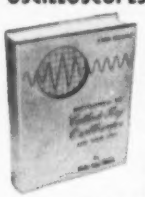

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Plan Meaningful Radio Lessons

By A. A. Vezzani

Learning should be easy and therefore effective, since things easily learned improve understanding, and understanding increases student interest and participation, contends the author. To do this, teaching should be carefully analyzed and organized, he says. In this article he stresses planned class and shop procedures, text assignments, instructors' guides, and tests, and provides several illustrations. Mr. Vezzani is Lecturer in Vocational Education, University of Michigan, Ann Arbor.

THE basic tools in teaching radio are class procedures, shop procedures, textbook assignments, instructors' guides, and tests. These are required to perform the task effectively. Let us inspect them and see how they may be applied.

Care of Equipment

Where practical shop work is included, one problem is instrument maintenance. Delicate measuring instruments, when placed in the hands of inexperienced students, are easily damaged. When this occurs, repair costs rise above normal. Yet, if the students are deprived of the opportunity to use this equipment, valuable experience is lost.

Teachers often lessen this trouble by using mechanical and electrical safety devices. These may include fuses, overload relays, electrical locks, etc. Others keep the electrical instruments under lock and key and do not permit use without their personal supervision. This latter method is time-consuming and does not lend itself to a desirable teaching situation.

Some of the damage to instruments may be traced to a lack of well-defined instructional procedures. It behooves the teacher to investigate carefully his own procedures of presenting the lesson. After such a review, a program of "Standard Procedures," commonly found in engineering departments, may be developed. This will include specific procedures in the use of a.c. and d.c. voltmeters, a.c. and d.c. ammeters, ohmmeters, volt-ohm-mil-ammeters, combination tube and set testers, signal generators, oscilloscopes, and capacity testers.

These standard procedure sheets will contain such items as: how the instrument is checked in and out of the stockroom or tool crib; preliminary meter check to determine if meter is defective or damaged; how to connect the instrument to the unit to be measured; precautions; and any others the teacher desires. *These procedures must be meaningful to the student if they are to obtain his respect and support.*

As indicated above, standard procedures may not only help to solve the problem of equipment damage, but also tend to eliminate other problems if the procedures are inclusive of all shop activities. Such procedures are: general shop safety rules, how attendance roll is taken, how tardiness and absences are treated when arriving at a grade, how "admit-to-class" slips are processed, how lesson assignments are made and the pattern of submitting them, how problem assignments are to be submitted, procedure followed in the use of tests and how tests are graded, how notebooks are to be maintained and graded, factors used to determine grades, and general tool crib regulations.

These procedures should not be looked on as rules, but rather as desirable and needed instruction. They enable the student to find answers to many questions which would otherwise be directed to the instructor, and by the same token, permit the instructor to devote more time to other tasks. These procedure sheets should be bound into a Standard Procedure Manual and, where possible, there should be a copy for each student.

Studying the tube-checker with the use of standard procedure sheets. (Courtesy E. C. Russell, Dir., Voc. Ed., Pontiac, Mich. Senior High School.)

When this is not possible, several copies should be placed at convenient points in the shop. Over a period of several semesters, with revisions based on class use, a manual can be developed which the instructor will find to be most helpful in his teaching.

The Textbook Assignment

Textbook assignments, properly used, can be an effective tool in teaching. Their correct use will motivate the student,

Fig. 1—Textbook Assignment Master Form makes learning more meaningful to the student.

Class Assignments—Radio Theory I
Textbook—Elements of Radio, by Marcus & Horton

Assign. No.	Items to Be Learned Purpose—To Teach Student	Pages	Week
1	A brief history of communication, Sound signals, Sight signals, The telegraph, The telephone, The wireless telegraph, Television	3-5	
2	Wave motion, Characteristics of a wave, Measurement of wave, Definition of frequency, Definition of wavelength, Meaning of amplitude	7-12	1
3	Light waves, The ether, Heat waves, Radio waves, Units used for the measurement of radio waves	13-18	
4	Purpose of aerial, Ground, The meaning of resonance, Radio tuning, How signals are heard, The function of the detector	19-30	
5	The meaning of inductance, Capacity, Units of inductance and capacity, Symbols for inductances and capacitors, The Henry & Millihenry, The tuning circuit	31-36	
6	Magnetism, Electromagnetism, Action of the telephone receiver and magnetic loudspeaker, symbols for these units	37-42	2
7	Flow of direct current, Flow of alternating current, Pulsating currents, Wave forms, Action of detector, The crystal detector	43-49	
8	The action of the two-element tube, The (etc.)		

make each lesson more meaningful, and improve class spirit and student morale. Too often teachers view the textbook assignment as of little importance and rely only on their own teaching to convey the lesson to the learner. Another factor which tends to minimize the importance of the assignment is the feeling that many of the students will devote too little time to reading it.

To increase student interest in textbook assignments *each assignment must be meaningful in itself and still be closely related to the previous assignment and that which is to follow.* Development of the assignments in this manner motivates the student, for it increases his understanding of what has been studied and prepares him for what is to follow. Furthermore, assignments of such nature will soon be recognized by the learner as stepping stones toward the goal established for the course.

A method which may be used to develop and incorporate the ideas set forth in the preceding paragraphs is shown in Fig. 1. This form not only provides a record of each assignment but establishes a means whereby changes or improvements may be made on the basis of trial and error. On this form each assignment is given a number and the important points to be studied in each assignment are indicated. In making the assignment from the form the teacher may explain briefly the items to which they should devote more time as well as those which are of relatively less importance. The pages of the assigned book are tabulated in the third column. The last column is designed to indicate the week of the semester. This provides a guide in terms of time expended on the course as well as in terms of the subject matter covered in any given period. In addition it enables the teacher to tell whether the material is being covered too rapidly or too slowly. The value of the information derived from this column becomes apparent after the course has been taught a few semesters and an average time obtained. This time element then becomes a standard and indicates the ability of the group to comprehend the instruction as compared with previous groups.

Some advantages of this method of making textbook assignments meaningful and appear in a logical sequence may be listed as follows:

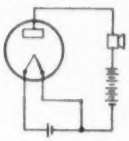
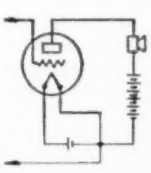
1. Indicates the important points to be studied in each lesson.
2. Tends to motivate the student and increase interest.
3. Adds "Guidance" to study.
4. Makes studying easier and comprehension greater.
5. Enables students who have been absent to determine easily what they have missed, and tends to decrease absenteeism.
6. Permits teachers to use student performance on assignments to supplement their evaluation records.
7. Provides teachers with the means whereby specific pages may be omitted from assignments without confusion.
8. Allows assignments to be made from any section of the textbook without the need of following page numbers in consecutive order.
9. Enables teacher to use the text on a content basis rather than on a page basis. Assignments can be made on the basis of content and not on the basis of number of pages.
10. Provides a perpetual record, thus making possible changes on the basis of experiences.

The Instructor's Guide

The instructor's guide, often referred to as the daily lesson plan, *is the most effective instrument devised for the improvement of teaching.* As someone once said, "daily lesson plans may not be required, but planned lessons are." Planned lessons make teaching truly a profession, for in planned lessons teaching approaches scientific procedures—scientific, because the lesson is planned to provide a meaningful approach, sys-

Fig. 2—The instructor's guide is the most effective instrument devised for improvement of teaching.

Teaching Outline for the Presentation of Lesson K
The Action of the Three-Element Radio Tube

Information to Be Discussed	Blackboard Aids
1. Explain the purpose of this lesson to the class as: a. To teach what is meant by a three-element tube b. To teach how this tube is shown in a schematic diagram c. To teach the purpose of the filament d. To teach the action of the plate e. To teach the function of the grid f. To show how the tube functions in a circuit	List items "a" to "f" on blackboard and discuss briefly
2. Through use of a blackboard sketch show how the envelope of the tube is represented.	
3. In the envelope draw the symbol for the filament. Show how filament is connected to the battery. Explain how filament is heated and emits electrons. Show electrons.	
4. Draw the symbol for the plate in the envelope. Show and explain how it is connected to the remainder of the circuit. Show the symbols for the phones and for the "B" battery.	
5. Explain the function of the "B" battery.	
6. Explain action of plate on the electrons and the flow of electrons through the circuit. Draw arrows along circuit diagram to show direction of electron flow. Discuss effects of increasing voltage on the plate. Show by means of a graph.	
7. Discuss action of tube with class to insure all understand the function and what takes place in the tube. Explain this tube is known as a two-element tube or diode.	
8. Explain to students another element may be added to the tube. Show how this is represented and tell it as the grid.	
9. Explain the action of the grid when it has a positive charge.	
10. Explain the action of the grid when it has a negative charge.	
11. Through the use of a graph show the plate current variations as the grid voltage is varied. Explain this principle as a factor of amplification.	

tematic arrangement of content, and efficient use of visual aids. Above this it provides a record, once used, as a basis for changes and improvements.

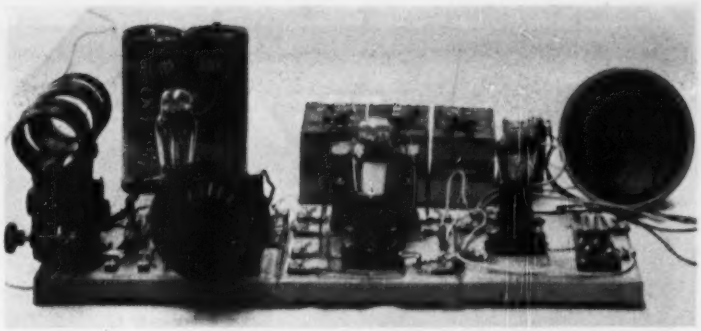
The first three factors mentioned are determined through a careful analysis of the lesson to be taught. The last factor, that of providing a record of how the teaching is done, is too often overlooked by the teacher. An instructor's guide may be likened to a bookkeeping system wherein desirable items appear as profits; and undesirable items, which the student found difficult to understand, appear as losses. These assets or losses can be recorded on the instructor's guide sheet once it has been assembled and tested. It is through such a system of record keeping that instruction can be improved on the basis of past performances.

There are many ways in which the radio instructor may develop and maintain such a record. The pattern of the ledger sheet is not important. It is important however that the instructor have one which he can use. Fig. 2 is an example of an instructor's guide designed to outline the step-by-step procedure followed in teaching the principle of a three-element radio tube.

Improving Instruction By Testing

Tests as a teaching instrument should not be overlooked in teaching radio. They can be used as an instrument of evaluation at the same time. In fact this is desirable, provided the tests give each individual an equal chance when making his response. All students do not perform equally well on any one type of test. For example, students who have the ability to express themselves well through the written word are more likely to react favorably to an essay-type test than those who have difficulty in such expression. These differences can be compensated for by using a variety of tests. This will insure that all students have an opportunity to express themselves in the way that fits their special abilities.

Examples of the types of tests that a teacher might use in teaching radio are matching, drawing or sketching, essay, completion, and multiple-choice types, some of which are shown here. Each test was designed to be answered in about 20 minutes. The remainder of the class period was then used to correct it, so that each student discovered his mistakes while the test was still fresh in his mind. Using tests in this manner makes them more interesting to the student, and is a valuable aid in teaching.



"Breadboard" construction using parts from discarded receivers. Unit shows detector stage, transformer coupled audio stage, and a resistance coupled audio stage. Units may be used independently or in combination with other units. (Courtesy E. C. Russell.)

Conclusions

The four areas relating to instructional procedures described in the foregoing pages are only a part of the organization which must take place in a teaching situation if learning is to be easy and effective. Things easily learned improve understanding, and understanding increases student interest and participation. Many a zealous and inter-

(*Continued on page 46*)

Note: Only a portion of each test is reproduced here because of space limitations. These sample tests are provided through the courtesy of E. Myers, Pontiac, Mich., Senior High School.

Fundamentals of Radio
(Matching Test)

Directions: In the numbered blank spaces at the right side of the page, place the letter corresponding to the words or phrases in the left column which are most correctly related to items in the right column.

A. Crystal detector
B. Cat whisker
C. Galena
D. Edison effect
E. Thermionic effect
Etc. . . .

Emission of electrons at incandescence	1.__
Use of grid	2.__
Places charge on grid	3.__
A-Battery and filament	4.__
Rheostat	5.__
Etc. . . .	

Radio Frequency Amplification
(Multiple Choice)

Directions: In the blank at the right, place the letter corresponding to the word or phrase which best completes the statement.

1. The tuning circuit (a) is employed to couple the final amplifier stage to the loudspeaker; (b) consists of an inductance and a variable condenser; (c) eliminates feedback in the R.F. stages; (d) None of the above. 1.__

2. The natural frequency of a tuning circuit (a) is determined by the ohmic resistance of the circuit; (b) increases when the inductance of the circuit increased; (c) varies inversely as the square root of the inductance and the capacitance of the circuit; (d) None of the above. 2.__

3. Etc. . . .

Fundamentals of Electronics
(Essay Type)

Directions: Read question carefully before attempting to answer it. Do not give brief answers. Write question and then write answer. Neatness is a factor in arriving at the grade. The number following the question is its point value.

In discussing matter it is often said that matter is composed of electrons, atoms, protons, etc.

Quest. 1. Explain the construction of matter using terms mentioned above. (10)

The electron theory is often mentioned in the laboratory and in the electrical shop. It is the basis for much of our electrical knowledge.

Quest. 2. What is meant by the electron theory? (10)

Etc. . . .

The Superheterodyne Receiver
(Completion Test)

Directions: Fill in the blank spaces, using one of the words or phrases listed.

audio	inductance
beating	intermediate
capacitance	mixing
difference	radio
mixer	first detector
heterodyning	superheterodyne
I.F. transformer	tuned circuit
incoming	etc.

In a tuned radio frequency receiver each _____ employed must be capable of being resonated to any frequency in the broadcast band. In order to do this, design principles must be partially disregarded. For each frequency there is one _____ to _____ or LC ratio which will catch a maximum signal. As it is impractical to use a special circuit for each frequency desired, the ordinary T.R.F. receiver is not completely satisfactory. Etc. . . .

Wave Patterns
(Sketching)

Directions: In the space provided alongside each question, draw the wave form requested.

1. A.C. Sine Curve (Wave)
2. C.W. Wave (Curve)
3. Damped Wave
4. Modulated Wave
5. Pulsating D.C. Curve
Etc. . . .

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Drawing Can Be Made Interesting

By S. L. Coover

Traditional methods of industrial-arts mechanical drawing instruction have drawn much criticism recently from those who assert that they do not provide the student with information and skills which will be useful to him in later life. Conscientious teachers realize the latter is their real objective. The author, director of the Industrial Arts Department, State Teachers College, California, Pa., gives some practical suggestions to this end.

IT IS universally agreed that industrial arts is a part of general education. This fact has very definite implications for the content as well as for the method used in teaching drawing. It suggests that the content have general application, and that the entire course be geared to common problems arising in the lives of the student. The focal point of teaching lies in the learner rather than in the materials of instruction. In brief, drawing content should represent a means to an end rather than an end in itself.

Why Learn to Draw?

Since drawing is a part of general education, and hence a required subject, we may well ask the question: What does the citizen need to know about drawing? What use does the average person have for an understanding of the common principles of drawing? Wherein can he profit from the ability to read and interpret blueprints and working drawings, to read and understand architects' drawings, and to understand and appreciate the principles of design as they apply to daily living?

We should go further and ask what use the junior-high school boy or girl has for drawing as of the day he or she enrols in the course. We know that he has had occasions to read as well as to express his thoughts in drawings and sketches from earliest childhood. The need for an understanding of this graphic language becomes particularly acute when his problems require actual shop or laboratory work. Drawing is the language of the school shop and the home workshop as well as the language of industry. Just as one learns to speak good English by trying to say something to somebody, one learns to draw by trying to tell someone something that can be expressed best or expressed only by drawing.

Therefore, a unit in blueprint reading and sketching is a prerequisite to effective industrial-arts work as well as to any type of shop work. A few basic principles of drawing are necessary before a pupil can work from another's plans, or before he can plan his own work. The ability to make and interpret drawings and sketches bears the same relationship to effective school shop work that the ability to read at all bears to learning geography or biology.

There is another series of questions relating to wage earning in a society that is largely industrial in nature, the answers to which have a direct bearing on drawing content and method. Does an appreciable sector of our working force make its living by making skilfully executed drawings? The answer to this question is no. What percentage of gainfully employed workers today need to read and interpret blueprints? Practically every adult needs to read and interpret technical or other data presented in graphic form which he encounters not only in his work but also in newspapers and magazines.

Make Content Meaningful

Drawing content should consist of a variety of interesting and teachable units such as: sketching, working drawings, lettering, furniture drawing and design, architectural drawing, plot plans, maps, pictorial drawing, graphs and charts, and methods of duplication including photography. A series of "plates" representing machine parts; or the old block method in which we start out with a block which has a corner cut off for the second plate, a hole drilled through it for the third plate and which goes through successive stages of mutilation until the student quits drawing in disgust, are useless. Drawing courses of less than college or technical-school grade should emphasize the skills and understandings that a user of drawing, consumer if you like, needs, rather than the highly developed skills of the draftsman who makes his living in this rather narrow field.

The better teachers today differentiate between the skills and the understandings inherent in drawing. They realize that highly developed skill with little or no understanding is useless. A person must learn drawing in terms of understandings and insights.

Skill in sketching should develop naturally with practice and as the basic drawing principles are assimilated by the student. The writer is one who believes that if skills are not developed the time spent in drawing or sketching has been largely wasted. But, he is convinced that understanding should come before, or at least at the same time that, the skills are developed. He has observed that where all the teaching emphasis has been placed on skill most of the students end up with neither skill nor understanding.

In direct contradiction to this, however, the writer, after visiting drawing classes for the past twenty years, is forced to conclude that too many teachers spend most of their time and effort in an attempt to develop skills, with little or no thought on the understandings involved.

Realistic and Useful Drawing

From the very first day at any grade level, drawing can and should be made realistic and useful to the student. He should have the opportunity to *read* as well as to *write* drawings, and the *reading* phase and the *writing* phase should be presented concurrently. Blueprint reading and sketching make the most satisfactory initial units of the course. Some of the most successful teachers give their students an opportunity to make dimensioned sketches on tracing paper of the project they are interested in making at school or at home. A blueprint or a white print is then made by the student himself. (The equipment needed may be as simple as two pieces of glass and a bottle of ammonia.) If and when necessary, the student revises the original tracing and makes a new print. He works directly from his own blueprint while making the project. This affords an opportunity to use the methods in vogue in industry as contrasted with the usual school method of *telling* about industrial practices while using a poor substitute.

This blueprint reading, sketching on tracing paper, print developing, and print use in actual shop situations should continue through the three junior-high-school years. The average student will probably draw or sketch more projects and problems than he will have time to make in the shop. Some of these problems may well be selected from science. Adams[1] in his dissertation presents ideas and points to the tremendous possibilities in this field.

Here, it may be well to repeat the statement that most of our adult con-

[1]Adams, Science Demonstrations for the Industrial Arts Shops. Office of Education Library, Federal Security Agency, Washington, D.C.

tact with drawing will be as consumers rather than as producers. Hence we will want to study all, or as many as possible, of the applications made of drawing, and the various techniques used to present statistical and other data in graphic form.

It is suggested that drawing instruments be introduced *after* the students have a usable grasp on the fundamentals of dimensioning, projection, and the like. It may be well to point out to the person who thinks that he cannot teach drawing without instruments that there are only a few units in all drawing that require their use. Of these, the two that are most useful are geometrical construction and development, such as sheetmetal drafting.

We have found it sound practice in teaching the use of instruments at the junior-high, the senior-high, and the college levels to require the solution of most problems, at least in part, in sketched form before the instrument drawing is attempted. This procedure saves time, permits concentration on solution of the problem while the sketch is being made and concentration on technique in the instrument drawing. This method also tends to prevent frustration on the part of the pupil.

Students Evaluate Their Drawings

One of the most promising of the newer teaching techniques is that of the student helping to evaluate his own drawings. At each grade level and for each type of unit there is a selfevaluation sheet to be filled out by the student. This selfevaluation form is given to the student as a part of the assignment, and is not something that is handed to him after he has completed his drawing. It is largely selfexplanatory but usually requires a brief explanation by the teacher. Most evaluation sheets show standards for such things as the weights of lines, lettering, dimensioning, and the like in addition to the special considerations of the particular unit that is being worked on.

This method has many things to recommend it. The student knows what is wanted and expected before he begins, he learns what elements of drawing are considered important, he has available a rating scale which he can easily match against his own effort, he is able to note his rate of improvement, and most important of all, he becomes a partner in his own education.

The teacher's part in this cooperative rating scheme consists in checking the column that is parallel to the one previously checked by the student and in discussing with the student points where the ratings are different.

Planned Visits to Plants

Since orientation is one of the important objectives of the junior-high-school years, the ninth-grade student should have an opportunity to sample a wide variety of commercial drawings and should become acquainted with industrial drafting-room practices. This objective can be attained by planned visits to manufacturing establishments, architects' offices, newspaper and magazine plants, patent attorneys' offices, sheetmetal fabricating plants, ship yards, airplane plants, and the like. In short, no drawing course at ninth-grade level is complete unless the student becomes acquainted with the draftsman's place in a work-a-day world. There he can see people at work in the kinds of jobs that may be open to him if he decides to specialize in drawing in the senior-high school or in a trade school.

It was stated above that this should be a "planned visit." This means that the instructor must visit the plant first and spend some time with the plant representative in going over the most effective itinerary for the students. He should pick out the special points which he wants brought to the attention of his group. For example, a short talk on the importance of accuracy or what is expected of apprentices in the drafting department is one of the most effective methods of teaching that the writer has ever witnessed.

A planned visit also implies that the students have been briefed on their trip beforehand. They should know in general what is manufactured, where it is used, and especially what to look for when they get to the drafting room. They will want to know the why of industrial drafting practices relating to lettering, dimensioning, original drawings made as pencil tracings, and the like.

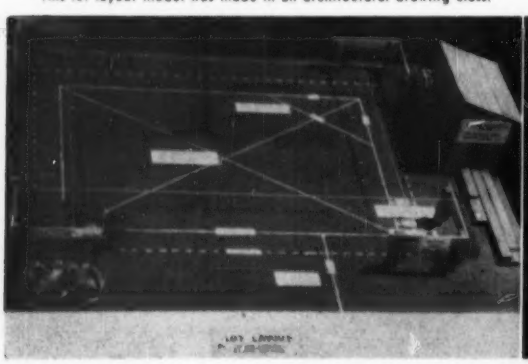
We have been for the past 30 years, and in many places still are, hopelessly lost in trying to teach techniques needed only by the architect and the engineer. We could have, and should have, been teaching drawing as a living language, as a method of expression surpassed only by speaking and writing.

Radio . . . . . *from page* 43

ested youngster enrols in radio only to become disappointed and disillusioned because of his inability to comprehend the subject content. Perhaps careful use of some devices such as mentioned in this article may help save some of these learners.

There are many ways in which teaching devices of the type presented here may be developed and used. Some teachers prefer the use of one group of devices such as those described while others may find it advantageous to use others available in the teaching profession. The selection will depend to some degree on the situation they are to be used in. The idea stressed here is that those used should be carefully analyzed and organized so that they may be used effectively and purposively.

Combining drafting with project making is urged by the author. This lot layout model was made in an architectural drawing class.



Students at the California, Pa., State Teachers College found this model made blueprint reading and drawing more meaningful.

Stress What's New in Electricity

By T. Glade Wilcox

Although "electricity is one of the fastest growing and changing fields of study," offering "increased project and job possibilities," it has lagged behind other areas of industrial education because its teachers hesitate to reject the old and accept the new, contends the author. He emphasizes a balance of preparation and student and group participation with presentation of related information and purposeful experience. Professor Wilcox is on the staff of the Industrial Education Department, Texas A & M College, College Station.

THE methods of teaching electricity in industrial arts grow directly out of the objectives of the instruction; the materials and processes used; the procedure of course organization[1], and the relation between informational content and activities. The objective of guidance is answered in part by the teacher's organization of content[2]; the objectives of consumer's knowledge and avocational interests by proper selection of electricity projects[3]; and the appreciations, growth of interests, character-building attitudes, and transfer of knowledge and skills are accomplished by the teacher's methods of rapport and instruction.

In this article, the four-step teaching plan as applied to electricity is enlarged to five steps and reworded to read: Preparation by the Teacher, Preparation of the Student, Presentation of the Content, Participation in the Learning Processes, and Evaluation of Students' Achievements. These five steps apply both to each unit of study in electricity and to the entire course.

Preparation by the Teacher

"The constant temptation of the school is to permit its materials and schedules of activities, once they have been selected, classified, graded, and organized into a curriculum, to become an autonomous program of selfperpetuating interests and subjects."[4]

Probably the reason electricity did not develop along with the other areas of industrial education up to World War II was the inability of its teachers to reject the old and accept the new. Pre-induction texts and their use as informational sources alleviated this difficulty. It is now the exception to find the electron theory discussed on Benjamin Franklin's outmoded current-flows-from-positive-to-negative basis.

The teacher must never be deprived of the privilege of organizing the content of industrial-arts electricity. Electricity with its related industries is one of our fastest-growing and changing fields of study. The content has increased, resulting in increased project and job possibilities, and the old subjects (magnetic compasses, d.c. motors, primary cells, etc.) have become of less importance. This requires organization with less time given to these activities, and more time on current developments.

It also requires organization with an additional purpose in mind—the transfer of concepts to their various practical applications. *One learns by doing: we learn electrical principles by applying them to new industrial products and practices.* Great teachers have been remembered because, through their organization of instructional materials, they have taught others to think for themselves. Simple and progressive related information units appropriately applied create a better classroom condition for this creative thinking.

Preparation of the Student

Recent studies have shown that *group learning situations contribute even more to the success or failure of teaching than does the pattern of instruction used.*[5,6] Group activity in teaching electricity is vital because the pupil is motivated by acceptance in his group, and not necessarily by home approval. (Woodshop projects are usually of more utility than electricity projects in the eyes of parents.)

If the teacher of electrical work is accepted, and if he accepts, studies, and understands the problems of the student, he has taken the first step toward maintaining discipline, creating motivation, assuring growth of interest, and toward the building of character. If the teacher creates a situation in which the social veneer of the student in the class has been removed, where each student respects the thoughts and abilities of the others, then the electricity class becomes a place where the objectives selected by the teacher are more likely to be attained.

Students will respect the teacher for his interest in their problems. He should ask himself: "Why doesn't Johnny want to build a transformer?" And he should seek a sympathetic solution to the problem. Autocratic, domineering, or "dictator" teaching creates blocked goals; and student adjustments become behavior, attitude, and learning problems. The teacher who increases his knowledge of the student increases his standing in the student's eyes. This suggests the following techniques in the preparation step:

1. Group discussion of parents' work and hobbies—bring out applications to electricity.
2. Teacher explanation of course objectives or goals, and group discussion of means of reaching these goals.
3. Teacher-pupil planning followed by teacher-pupil participation in clean-up duties. (This means that if the students sweep the floor during clean-up period, the teacher should at some time also sweep the floor.) *Modern Shop Organization for Industrial-Arts Classes* by C. H. Groneman, published by the Canvas Products Corp., Fond Du Lac, Wis., gives plans that are applicable to industrial-arts electricity.
4. Student preparation of autobiographies showing background factors that would be of interest to the teacher as the first assignment.
5. Student-teacher planning of tool and supply issuance.
6. Posting, or explaining to students, the records, budget, supplies, and the cost and prices of materials.
7. Group participation in introducing each new unit, and in the planning of acceptable jobs or projects as vehicles of instruction.
8. Relating informational content to projects being made or which can be made in the shop. This necessitates integration of "Doing" and "Knowing" and is of particular importance in any subject, such as electricity, which contains a large amount of necessary and related information.

These steps may be applied also to the presentation of content, as they will tend to improve the morale of the group. It is interesting to note here that industry knows that morale is improved when employes are permitted to participate in

(*Continued on page* 51)

[1]Mays, A. B., "Industrial Education," *Encyclopedia of Educational Research*, p. 581. New York: Macmillan, 1950.

[2]Wilcox, T. G., "Post-War High-School Electricity," *Industrial Arts and Vocational Education*, XXXVI:6 (June, 1946), 236-40.

[3]——"Selection of Projects Is Important in Industrial Arts," SCHOOL SHOP, X:4 (December, 1950), 14-15.

[4]Childs, J. L., *Education and Morals*. New York: D. Appleton-Century-Crofts, Inc., 1950, p. 35.

[5]Lewin, K., "Patterns of Aggressive Behavior in Experimentally Created Social Climates," *Journal of Social Psychology*, X (1939), 271-79.

[6]Anderson, H. H., and Brewer, I. E., *Studies of Teachers' Classroom Personalities*, American Psychological Association, Stanford University Press.

[7]Rogthlisberger, F. J., *Management and the Worker*. Cambridge, Mass.: Harvard University Press, 1940.

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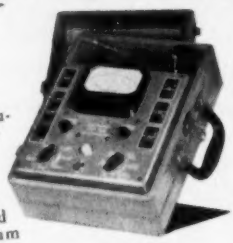

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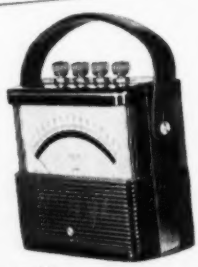

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Available with or without base. Widely used in school instruction where dependability and low cost are paramount. Sensitivity: 22 microamperes. Resistance: 23 Ohms. Scale: 30-0-30. Medium and extreme sensitivity models also available.

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Rugged, serviceable for all-around use. Available in single, double, and triple ranges for voltage measurements; single and double ranges for current measurements. Accuracy 2%.

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Electricity . . . . . *from page 47*

work that is planned and executed democratically.

Presentation of the Content

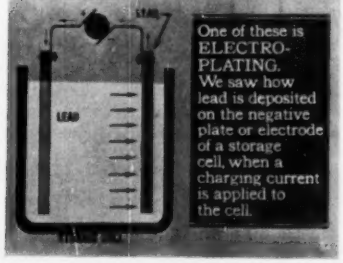
With the arrangement of content in simple and progressively related information units, and the preparation of the student by his participation in planning, its presentation is integrated in moving from unit to unit and project to project. The class in electricity is ready for the presentation of a new unit when it indicates its readiness by group consensus brought on by the teacher-pupil planned assignment.

To better present clear explanations, *the teacher must point out the basic principles and relate them to student projects.* To create scientific thinking in solving electricity problems of a maintenance and repair nature commonly found in the electrical shop, the student must first gain the habit of forming an opinion from observable factors; then he must search for additional information, in references and with test equipment; and finally test the solution by determining if the job works. To develop judgment abilities applicable to the electrical industry and its products, the student must participate in activities in which he feels a need and in which he understands the total relationship to his school, society, and the unit studied.

To assist the teacher in making clear explanations, and to help the student think scientifically, and give him an understanding of relationships, *as many visual aids should be used as can be obtained from various sources, or prepared in the school.*

Books, magazines, catalogs, pamphlets, and manufacturers' literature provide technical, avocational, safety, occupational, and other cultural, related, and necessary information in electricity and radio as well as instructional material on operations and projects. The teacher's aim in the planning center should be: "Get all that can be gotten!"

Electroplating demonstrations help pupils understand electricity, and can be done easily. This Jim Handy slide-film frame shows the process.


GENERATOR
LEAD
One of these is ELECTRO-PLATING. We saw how lead is deposited on the negative plate or electrode of a storage cell, when a charging current is applied to the cell.

Charts, exploded drawings and diagrams, blueprints, plans, posters, and show cards relate planning to doing and hence should be available in the planning area and in the shopwork area.

The construction of some of these aids by the teacher and the students should be an integral part of the course work. When Johnny doesn't want to build a transformer he can gain more by constructing a teaching aid which will be beneficial to himself as well as to others, instead of being required to make a project for which he sees no need. His pride in knowing that his handiwork will remain as a token of his contribution to the shop should never be discouraged if we are to develop democratic citizenship. To supplement shop-made aids, industry has made available free and economical materials.[2]

Models, mockups, cut-aways, samples, demonstration panels, and synthetic trainers should be planned by the teacher and the students, constructed as group activities, and made available in the shopwork area.

Movies, television when available, strip films, slides, still pictures, and visual gear such as oscilloscopes, panoramic adaptors, and large-faced meters should be thought of as teaching aids in the presentation step of any teaching situation. Their significance becomes doubly important in electricity and radio because the students learn how to operate electrical appliances as prospective customers. Sources of visual aids are published regularly.[3]

Recordings (tape, wire, and disc), radios, and communication receivers become aids in teaching, and also industrial products which the student should learn to operate correctly.

The integration of as many aids as possible in presenting electricity finds its importance in the fact that electricity and radio contain a large amount of technical information that is both necessary and related. *The good teacher finds as many ways to present his subject as there are needs to compensate for the technical content of it.* Lectures and assignment-study-recitation methods are not as applicable to general unit-shop electricity as are cooperative group patterns and individual problem solving brought on by the project method of teaching. However, research does not reveal any best pattern of instruction; and particularly not in subject matter that becomes outdated as fast as the books roll off the press. The teacher's judgment in the specific situation should determine the methods employed.

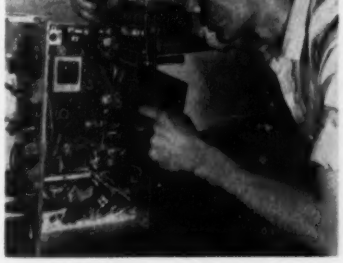
Participation in the Learning Processes

In industrial education, we believe in learning by doing. In electricity, we learn to wire circuits by wiring *meaningful* circuits, and not by contrived experiences or by doing excessive amounts of sheet-metal work, machining, or woodwork on a project. *An electrical project should consist of operations normally engaged in by people working in the electrical trades and industry.* This necessitates kits and other aids to supplement project construction in order that the abundannce of time will be spent by the student on actual electrical work. (See footnote 3.)

Magnetic materials in a nonmagnetic state can be obtained. Burgess Battery Co. produces a dry-cell kit. Storage battery parts and acid are available. Materials for electroplating are relatively economical. Fluorescent lamps can be made with ornamental gutter and fluorescent lamp accessories. Rectifier power supplies, crystal detectors, and simple one-tube receiver parts can be purchased at radio supply sources. Repair parts for irons, motors, heaters, and other appliances are found at appliance repair stores. A transformer manufacturer has agreed to market, with materials taken from the assembly lines, a transformer kit applicable to a variety of purposes. General Electric Co. markets ¼-h.p. motor and generator kits that need only to be wound and assembled. Surplus

(*Continued on page 60*).

Converting war-surplus radios into usable material for the shop is urged by the author. This student at Eugene, Ore., Vocational School converts one to amateur frequency band.



[2]General Electric Co., Schenectady, N.Y.; Weston Electrical Instrument Corp., Newark, N.J.; American Telephone and Telegraph Co., New York City; Cannon Electric, Los Angeles, Calif.; Thomas A. Edison, Inc., West Orange, N.J.; Westinghouse Corp., Pittsburgh, Pa.; Willard Storage Battery Co., Cleveland, Ohio; Radio Corporation of America, Camden, N.J.; etc., have prepared such materials.

[3]Wilcox, T. G., "Audio-Visual Aids in Electricity Shop." SCHOOL SHOP, IX:9 (May, 1950), 8-9.

In TODAY'S *Graphic Arts Instruction*

OFFSET'S A MUST!

Offset is already as essential a part of modern printing as letterpress, and is growing rapidly in importance. Practically any shop the student eventually enters will have an offset department, usually equipped with one or more ATF Chief offset presses. For the same reasons that printers choose ATF Chiefs for high quality, fast and profitable production, these presses offer numerous advantages for student instruction. Their design and construction are easy to understand, their complete facilities and simple adjustments for the finest offset work are readily mastered by the students. What they learn on a Chief will give them complete command of any other sheet-fed offset press.

Write for detailed information on the ATF Chiefs and other ATF equipment for graphic arts instruction, as well as for complete cooperation in laying out and planning the department.

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Modernize Your Graphic-Arts Course!

By R. Randolph Karch

Many printing instructors are relying too heavily on teaching letterpress, hand composition, and feeding a platen press, while neglecting newer processes like lithography, and the modern layout-design used in today's magazines, contends the author. Mr. Karch is Coordinator of Trade and Industrial Education at the University of Pittsburgh, Pa., and the author of numerous books and articles on graphic-arts education.

GRAPHIC arts, like all other industries, has made great strides in the last decade. A graphic-arts curriculum, to keep abreast of these strides, must contain processes other than letterpress, the usual setting of straight matter, and feeding a platen press—all now quite passé educationally as well as industrially.

Offset-lithography is doubling itself every eight years. Silk-screen printing is another fast-growing and applicable process. Lithography is a "must" in any plan of course expansion, and the silk-screen process is easy to add, both as to equipment and materials. At the same time, we should not overlook the Linotype and Monotype machines, and the Intertype and Ludlow Typograph, so often ignored in the past.

New Inventions

Other new inventions which cannot be overlooked are the processes of xerography, gravure, the new magnesium letterpress plate, the Intertype Fotosetter and the Mergenthaler Linofilm, the Fairchild Photoengraver, the many "cold-type" composition devices such as the Justowriter, the Vari-Typer, the DSJ Coxhead composing machine, the application of the IBM electric typewriter, the ATF Hadego composing machine, the Fairchild Lithotype, paper-pad type like Artype, Fototype, etc., and Magnetype.

Graphic-arts shops may include linoleum and wood block cutting (now largely replaced by rubber plate cutting and molding); dry-point etching on both celluloid and copper, and copper etching with acid (photoengraving); and bookbinding and book rebinding, which may include handtooled leather covers.

Modern Layout-Design

Consumer knowledge and vocational skill objectives both demand that the instructor teach *modern* layout-design. This has been a weak feature of graphic-arts education throughout its history. It behooves the instructor to become aware of the need for it, and to prepare himself to know and to teach it. The day of mere centered lines, even though in balance, is past if the instructor is to keep pace with industry's acceptance of off-center balanced layout, prevalent in any national magazine today.

Visual Aids: Neglected Field

It is not always true that examination of the "actual thing" is better than "pictures" in graphic-arts education. Example: one cannot grasp the working of a linotype metal pot or casting mechanism by watching the machine "work." Visual aids allow the student to "sit within the machine." Likewise, the structure of a plate used in offset-lithography, and the adherence of the developing material, can be more easily seen on charts than on the plate itself.

The greatest, least expensive, and most often overlooked sources of visual aids for graphic-arts education are the *trade magazine illustrations*. The writer, over a period of years, has assembled and correlated several thousand such illustrations, which cover every phase of the graphic arts. Used in an opaque projector, a picture may be used immediately on a screen with no preparation or cost other than pasting the illustration on a postcard-sized cardboard, easily fed into the projector. By manipulating the lens and copyboard, a pencil or pointer may be used to indicate parts of the illustration—the pointer is projected too.

Copy, after assembly from various sources, can of course be made up into film slides or film strips. Such a wealth of instructional material is usually lost unless cut out and used—it is buried in thousands of unindexed pages. Yes, the magazines are "destroyed"—but for a functional purpose. It is better to have live visual aids than unused files of old magazines!

Demonstrations: Be Functional

Demonstrations of processes, operations, or use of equipment are hardly functional unless immediately followed with the application of the principles involved by the student. To accomplish this, the instructor is required to separate the class into "areas," presenting lessons to small groups. Since this works some hardship on the instructor at the start of the term, he should depend on texts or other prepared job, operation, or information sheets to occupy the other students.

"Busy work" hand composition has remained popular to take care of these situations, although it no longer is an important part of commercial printing. Work on design and layout would be far more profitable to the students by teaching them the composition of display matter. However, scarcity of display type faces usually prevents the needed change. The answer here is to requisition an adequate supply of display type faces. (*Continued next page.*)

Students at Springfield, Mass., Trade School do all posters for the school as silk-screen work. The author recommends including this in the graphic-arts course.

Adequate Display Type

An adequate representation requires type in series of sizes from 6 or 8 point through at least 36 point in the following styles: sans serif (Sparton) medium, bold and extrabold, and its companion condensed version; the same in a square serif (Stymie), Bodoni Light and Ultra Bodoni, Garamond and Garamond Bold, Lydian and Lydian Bold, Baskerville, Bookman, and several "stationery" faces. The italics should be added in each instance, perhaps 10 point to 24 point. A few Blackletter and some miscellaneous scripts should be stocked. Such faces as Cheltenham, Century, and Caslon are passé.

Substitutes for needed cuts for illustrations in layout and display composition, including advertisements, are clippings from old magazines. Such illustrations are outlined on the layout, or pasted lightly in place for removal to the proof later. A morgue may be built from old cuts in photoengraving or electrotype form secured from local printers.

School Print Jobs: Pro, Con

Printing is a handy helper in all fields of endeavor. School administrators soon realize this, and use the school plant as a private, money-saving source of graphic-arts material. Some observations on this point will be pertinent. Certainly "live" projects are motivating devices—provided the student does not continually labor on repetitive operations. Students, of course, should produce such work—not the instructors. Also, the instructor should be the sole judge of how, where, and when such work is produced.

Left: Regular "hot" type illustrating new off-centered layout style with display lines, as opposed to traditional centered style.

Right: New time-saving "cold" type utilizing paste-up display heads demonstrating same modern layout style.

Display Lines

Differ from other elements in a piece of printing in that they

Attract Attention

of the reader, who should not be confused by directing his attention to

Too Many Display Lines

*

TOO MUCH DISPLAY

is NO Display

Display Lines

Differ from other elements in a piece of printing in that they

Attract Attention

of the reader, who must not be confused by inviting his attention to

Too Many Display Lines

*

TOO MUCH DISPLAY

Is NO Display

A school newspaper story set in "cold type"—in this case the DSJ Coxhead Composing Machine.

Runge Wins National Newspaper Essay Contest

Phyllis Runge, freshman, is hereby named winner of the essay contest on the subject, "Freedom Goes Where the Newspaper Goes," held in celebration of National Newspaper Week, October 1-8.

Other projects included a Herald staff display of the processes of publishing a paper, an exhibit of first issues of early American newspapers prepared by junior English classes and a library committee, and an assembly program with discussion conducted by Robert O'Dowd, advertising retail manager of the Enquirer.

Journalists returned from a Friday afternoon tour of the Cincinnati Post with such souvenirs as an original cartoon or a cut of Leo Hirtl, columnist, and a complimentary final edition.

The above paragraph is composed in DSJ Tribune News No. 610; this paragraph is in News Bold No. 640. Sizes are 7½ point. Head above is 12 point Sans Serif Bold No. 670.

Early deadline work should be refused, particularly on the industrial-arts level. Probably the better argument is to show how, in detail, too much production interferes with instruction—and a decision demanded whether the shop shall be a school or a factory. Such an attitude takes courage. However, only courageous people make for progress in education.

Testing: Rank Method

Tests, if used adequately, can aid considerably in learning as well as showing competency in instruction. Unless the objective is English composition, the objective-type test should be used, because a greater number of questions can be asked, with ease of scoring. Weighting can provide for more important answer worth. If we have time to teach, we should take time to see if learning is evident.

The apparent competitive spirit in youth makes a "speed test" invaluable in vocational graphic arts. Printers think and price work in terms of time. Graphed ratings, with deductions in time for errors made, show comparisons of ability among vocational students. Projects can also be ranked by comparison.

Students should be "ranked" rather than "percented." A "5/35" as a rank is more significant than "89 percent." The 5/35 shows that a student ranks fifth in a class of 35. A "grade" of 89 percent or an "A—" is meaningless as it stands alone. Was this the highest, middle, or lowest "grade"?

Discipline: Keep Them Busy

Discipline, good or bad, is determined largely by the extent to which an instructor can plan his class work so that each member has an assignment for every part of each hour he is in shop attendance. This demands organizational ability on the instructor's part.

The instructor should keep in mind that consistency, justice, and tact are important; that chastisement is not necessarily correction; that school work should not be assigned as punishment; that mass punishment should never be inflicted for an individual's deeds; that no attempt should be made to turn students into informers; and that a teacher who "burns up" over pranks puts on a show that can rival any comedy now seen over TV.

Rules: Don't Go "Hog Wild"

Some instructors go "hog wild" on rules. One posted rule the writer removed from a wall some years ago said: "Do not throw type out of the window." What a suggestion to eliminate the unpopular task of type redistribution! Another rule forbade the setting of one's name in type. In this case, the writer was convinced that this natural human tendency could be turned to advantage as a motivating factor. Faculty eyebrows were raised when a small hand press was installed for the express purpose of *requiring* each student to print himself 50 calling cards—but it worked!

Safety rules, however, are necessary—such as having only one student operate a cutting machine, and prohibiting talking to press operators. The "technique" of placing more than one boy on a platen press is to be deplored from both a safety and a practical standpoint. "A" hands a sheet to "B," "B" puts it into the press, "C" takes it out, "D" operates the trip, and "E" holds the ink spatula! Quite tops in inviting disaster, as well as a ridiculous trade practice.

Modernizing the graphic-arts course takes ingenuity, imagination, and knowledge of the newer trade practices, but the results make the educational program much more significant.

Auto Shop . . . . . *from page 14*

ponents in assembling, disassembling, and studying. Nothing can build more respect for the teacher than a work assignment (from previously prepared lists) for each and every student in the group. It is a good plan to have units of instruction outlined and prepared in duplicated form with the problem set out on the sheet and the procedure outlined in detail. Provide space for the names of the students who are to work on, and be responsible for, a certain piece of equipment. Incidentally, teaching auto mechanics, like everything else, is made hard or easy according to the preparation made by the teacher for the task.

Presentation

Presentation of lessons is by various means including lectures. These need not be long, and they should be supplemented by duplicated instruction sheets which are again supplemented by verbal instruction by the teacher as he goes from group to group. There should be a great many "don'ts" and a great many "do's" voiced by the teacher. For instance: "Don't grip polished steel parts in a steel-jaw vise; always use some protective means such as copper jaws." "Don't use a hammer for driving a shaft out of a bushing; do use the arbor press." These should be emphasized both in the lectures and in the supplemental material.

Pupil Testing

The use of a variety of pupil tests leads to consistent growth on the part of the pupil. The printed information sheet dealing with outlined operations should have at its end a number of test questions which are required to be answered by the individual pupil or the pupil group. These should be considered to be a part of the job and should be turned in and graded daily.

During the classroom instruction period time should be reserved for questioning. It is not a good plan to cover large areas in the textbook without stopping at intervals to check up on the learning process. Nothing is more provocative of thoughtful attention than the knowledge that one is likely to be called on to answer questions in relation to the discussion and study. True-and-false and similar check-up tests are recommended.

The question of the value of the term or semester test has always been a moot one. Of itself it is doubtful whether it is of great value. On the other hand it is a great stimulant for thoughtful study, and there is no question but that because of its anticipated use the student's progress in the acquisition of factual information is materially helped. The use of the formal examination also has a certain value in the overall training of the student as many students do come up against situations in later years where it is necessary for them to take and pass similar examinations if they are to be the recipients of the type of employment opportunity they desire. Because of this, it is well to have some training (gained by experience) in taking formal examinations.

It is doubtful whether there is any other phase of industrial work so largely dependent on paper work as is the automotive industry. The student who is unable to read intelligently, and who is unable to interpret line drawings and pictures, is definitely handicapped when he tries to make progress within the industry. Most car manufacturers conduct service or clinical schools on their new products each year.

It is necessary for the mechanic to be able to read and understand the instruction given to him at that time. It is quite essential to good service work that the mechanic be able to read and interpret printed instruction without help from others. One of the greatest services our schools give the auto-mechanics student is training in ability to read and understand. Examination helps to show

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whether he does or does not understand what he has read.

Pupil Grading

Since the automotive course is set up on some basis of units of credit, whether it be within the high school or the university or technical institute, a careful system of grading and grade recording is essential. Usually, of course, this is simply part of the instructor's program of grade recording. No new or different form should be used but the one which is common to the school system should be adopted. In the experience of the writer, one never knows when the student is going to come back to the school system and ask for some kind of record or transcript of credit. This may be anywhere from a year to 15, 20, or 30 years after the completion of his course. Since the shop work does fit in with the school program, it should also fit into the school grading program.

Enthusiasm, sincerity of purpose, attention to detail, maintenance of tools and equipment, cleanliness and orderliness, preparation and follow through—these are essential to growth of pupils and teacher in the automotive shop.

Teaching . . . . . *from page 6*

be done by the pupils, if the class organization is such that some of the tasks of this kind can be assigned to them.

Handling Tools and Equipment

A teacher is judged to some extent by the manner in which tools and materials are distributed and collected. Some teachers have all hand tools mounted on boards in a manner which simplifies checking at the end of the period. This is quite effective as the teacher can tell at a glance if a tool is missing, and he can hold the class until the last item is found and placed where it belongs.

Other teachers prefer to have all tools located in a toolroom, under the care of a pupil who has been designated as toolroom attendant. In this plan, each pupil who receives a tool must sign for it, or he must deposit a check with the number of his bench on it. Regardless of the system used, the attendant knows who have received tools, and can report to the teacher at the end of the period that everything is in its place, or that some particular tool is missing. Either of these schemes is simple, and is likely to lighten the load of the teacher in protecting the department from loss.

The problem of handling stock and issuing it to the pupils presents difficulties for the teacher. In one school a man is employed in the machine shop. This individual receives the lists of material from the pupils, and has the necessary stock ready for the following period. This system was introduced to eliminate the possibility of injury to a pupil, but it is unlikely that many schools could afford to use it.

Another method is to assign to a pupil the job of issuing stock, and to hold him responsible for keeping a record of what is issued to each member of the class. This too has a disadvantage in that it interrupts the class work of the attendant, and often leads to general dissatisfaction.

Most Common Method

The most common method is the one in which each pupil selects and cuts out his own material. This is good from the standpoint that it provides the pupil with valuable experience, but it is likely to be expensive. However, cost is not as important as worthwhile experience in some cases.

Whatever system is adopted, it is important that the teacher have some means of knowing how much is being used, and who is using it. He should know which pupils have to have spoiled pieces replaced, and how many. This information can be made available only if an effective recording system is used.

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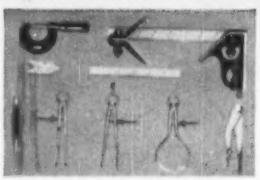

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Achieving the Maximum

Space limitations make it impossible to deal with all of the jobs the teacher has to do. It is equally difficult to mention all of the methods possible for each job. However, we would like to make the point that the methods used by the teacher have a profound effect on the kind of teaching he does. It is suggested therefore, that each teacher consider the methods he is using, and raise the question with himself: "How can I improve my methods to the end that my pupils will receive the maximum of good from my teaching?"

General Shop . . . *from page 9*

try. Following such reading or excursions, short oral reports should be made to the class or written reports should be submitted to the teacher.

An effective type of report, sometimes called the project folder, can be obtained from some pupils. It consists of an essay or report of the reading or research done by the pupil together with pictures, photographs, diagrams, and drawings to illustrate the subject.

Records.—The course of study is the teacher's road map. It is a forward-looking plan for the year's work. Records help a teacher to realize what has been taught and what pupils have done. They must continually be compared with the course of study. Without a plan and suitable records, industrial-arts pupils drift through the year doing the next thing and in all probability they miss many of the most important values.

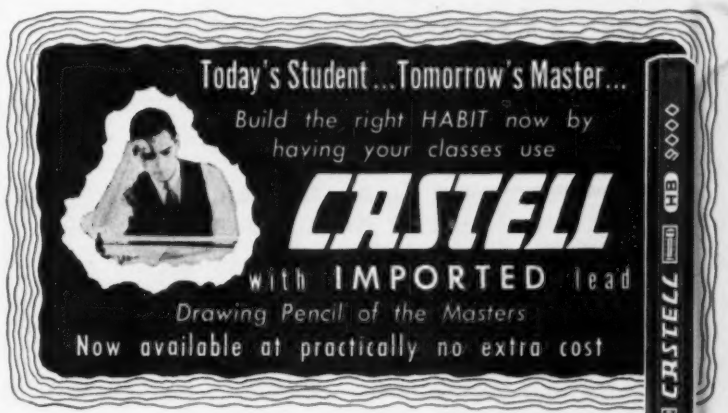
Records should be kept which show: (1) projects made by each pupil, (2) demonstrations taught by the teacher, (3) related lessons taught by the teacher, and (4) operations and processes performed. With these records and a course of study, teachers develop foresight and hindsight which result in an educationally sound offering.

Many teachers object to record keeping but there is an easy way out of this routine. The office manager (pupil personnel management) may be assisted by a pupil who is charged with the responsibility for keeping progress records for his class. Some of these progress records may be in chart form. In other cases they are kept by the individual pupil on an accumulative progress card. The good general shop teacher has a record of the progress of each pupil and each class.

Tool panels.—The attractive and efficient storage of tools within the shop contributes greatly to the general appearance and utility of the room. Tools mounted on a single panel centrally located simplify checking for the teacher and in many instances reduce pupil traffic within the shop. Tools hung on a panel painted a neutral color can be most readily selected and replaced by the pupil. Some teachers draw the form of the tool in outline to facilitate replacement after usage. Many teachers place the name of the tool in close proximity to its particular location in order to provide automatic learning of tool names. The most attractive tool panels are surrounded with a border painted with an interesting color in harmony with the principles of good decoration.

Special tools are frequently mounted on panels close to the machinery or the benches where they will be used. These special tools which may be scattered throughout the shop are those which have little value in any other place and which will not be transported to other sections of the shop or school under ordinary conditions. The dado head, forging hammer, lathe tools, dogs, and face plates are a few of the specialized tools which seldom wander from their location.

Individual and group projects.—It is common practice for industrial-arts teachers to encourage or at least allow pupils in their classes to construct articles of interest to the individual, providing the difficulty of construction and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educational value are appropriate. In some classes this policy is followed throughout the year. In other classes teachers prescribe the first project and later allow controlled choice. It is perfectly apparent that if pupil-felt needs are to be met they must be allowed as much choice as possible in the kinds of articles which they will make at all times.

Group projects, requiring group planning, group work, and a finished product which an individual cannot own, present opportunities for pupils to learn to think together, to subdivide their work, pooling their individual efforts for a common cause. One illustration of this type of work is a lily pond which might be constructed in the school yard by a group or class. This type of group project involves several kinds of construction work and considerable planning.

A second type of group project which is highly valuable in its interpretation of the meaning and operation of modern industry is a mass-production job in which each pupil in the group performs a single operation in the making of an article. It might be a fishing spoon. In this case the first pupil traces the form of the spoon on a piece of sheetmetal, the second pupil cuts the blank, the third pupil smooths the edges, the fourth pupil drills the holes for the hook and the leader, the fifth pupil raises the spoon, the sixth buffs the surface, the seventh applies the enamel, the eighth attaches the hook, the ninth applies the lacquer. This project, developed in this way, interprets mass production. If a sufficient number of articles is made, the pupil feels the monotony of repetition and ultimately receives a finished product for which he may have some use but on which he has done relatively little work. It is a splendid once-a-year job.

Visual aids.—It is not fitting to close without mentioning the current and growing practice of showing films, process and product charts, finished models, pictures, drawings, models of mechanical contrivances, and many other devices which are used for teaching purposes. These are common to a greater or lesser degree in almost all shops. The only thing that needs to be said is that we should do more of this type of work.

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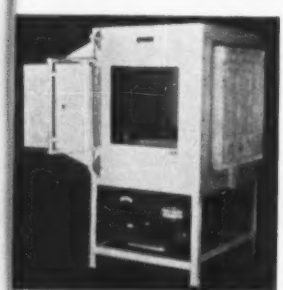

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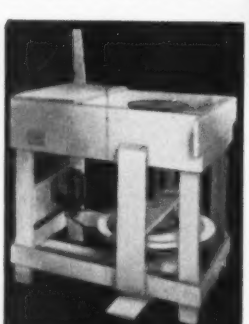

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IN THE Morning Mail . .

[Brief comments about SCHOOL SHOP and the field it serves are invited. Address the Editor, SCHOOL SHOP, Ann Arbor, Michigan.

Dear Sir:

"16 Nails 10 minutes long!"

(P. 21, February 1951 issue, SCHOOL SHOP)

Editor's Note: "SCHOOL SHOP humbly suggests that the New York City Board of Education institute an in-service teacher-training program in tool literacy."

I humbly offer for the enlightenment of the honorable editor a bulletin entitled *In-Service Courses for Teachers Offered by the Board of Superintendents of the Public Schools of the City of New York . . .*

This bulletin lists 644 courses in order to meet the needs of about 37,000 teachers in all divisions and bureaus of the school system. Special attention is called to 26 industrial-arts courses sponsored by our department in which "Tool Literacy" is adequately covered.

Can We Help It If She Did Not Register On Time?

John M. Hurley,
Acting Director of Industrial Arts, Elementary and Junior High Schools, City of New York

SCHOOL SHOP is glad to learn that New York City has so many industrial-arts courses for its teachers. We hope the lady who asked for the nails takes advantage of some of them soon.

Dear Sir:

. . . Through the contents and articles . . . in SCHOOL SHOP . . . the students in my classes are developing the modern philosophy of industrial arts. I have given (your) address to all our prospective graduates . . .

Congratulations on the find work . . .

Glenn C. Jordan,
Assistant Professor of Industrial Arts, East Tennessee State College, Johnson City, Tenn.

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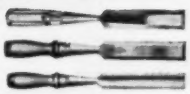

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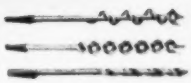

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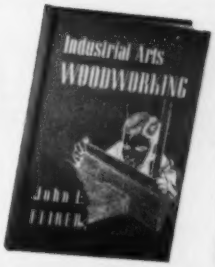

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Electricity . . . . . *from page 51*

relays, radios, and motors can be converted to usable material. [10, 11, 12, 13, 14]

[10]—"Receiver Conversion for the Novice." SCHOOL SHOP, VIII: 5 (January, 1949), 6-8.

[11]—"The Novice Converts the R. U. 18/19." SCHOOL SHOP, IX: 1 (September, 1949), 14-16.

[12]—"Surplus Material Used in Radio." *Indiana Industrial Education Bulletin*, XXVIII: 6 (July, 1949), 4.

[13]—"Plug-in Exciters from Command Set Transmitters." *QST*, XXXIV: 1 (Jan., 1950), 54-56.

[14]A bibliography of articles on conversion of surplus electronic equipment applicable to school use. Washington, D.C.: U.S. Office of Education.

The parts for the assembly and wiring or the repair of many other items applicable to electricity in industrial arts are available and can be obtained if the teacher uses the initiative that he desires to instill in his pupils.

Some industrial-arts electricity teachers would have participation time spent on field trips, movies, talks by people in industry, and the discussion of the more complex phases of electricity as used in industry, medicine, and other fields. These topics are a part of the preparation step, or they are related information; and their use in class time (other than directed study), which is normally used for student participation, means that preparation is out of balance with participation and that related information is consuming more than its share of classroom time. *This balance of preparation and participation along with related information and purposeful experience is essential to the success of any industrial-arts class.*

Evaluation of Students' Achievement

Evaluation in industrial-arts electricity courses should include appraisal of "knowing," "doing," and "being." It is common practice to test for knowing through standardized, published, and teacher-made tests. There is no exception in electricity and radio. Tests are given to determine to what degree the objective has been reached, to diagnose a student's achievement which indicates the teacher's effectiveness, to motivate, and to determine grades. One of the weaknesses of this plan is that the beginning electricity teacher gives too many of these tests while the more experienced teacher gives too few.

A well-rounded testing program in electricity should evaluate the project either during the progress of a unit or at its completion. The first method, the use of progress charts, requires display where every student can watch his own advancement. The second method necessitates rating scales and could be a student-teacher participation activity. Manipulation and performance testing is essential on certain basic operations, such as splices and soldering, in the place of an assigned job. Object or identification tests apply well as motivators to learning the various parts and symbols.

Trait and attitude indicators can be constructed by listing observational behaviorisms for still others to scale. Scales of this type, used at the beginning of the course and at the conclusion, become indicators to the teacher of the effectiveness of the rapport, the degree to which the student has achieved character-building goals, and with experience, can serve as a basis for trait and attitude grades. The complexity of the testing program should not be in direct proportion to the complexity of the subject matter. A little of each kind of evaluation over the three factors of industrial arts: "doing," "being," and "knowing," is a much better electricity testing program than many of one or a few kinds of pencil-and-paper tests.

Industrial-arts electricity subjects can be successful if the teacher wants to make a success of his teaching.

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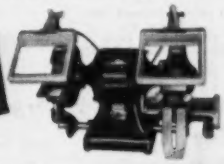

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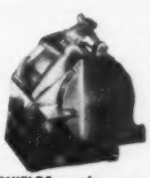

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A complete and up-to-date guide to sources of equipment and supplies needed in shopwork. Addresses have been given in each case for your convenience in writing firms listed. On your request all firms listed will be glad to supply you with catalogs and information about their products. Please mention School Shop when writing.

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Cleveland 5, Ohio
The Cincinnati Tool Co.
4059 Montgomery Rd.
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The Lufkin Rule Co.
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Saginaw, Mich.
Mall Tool Co.
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Skilsaw, Inc.
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Chicago 30, Illinois
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South Bend 22, Ind.
Stanley Tools
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Wm. Dixon, Inc.
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Newark 1, N.J.
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Greenfield, Mass.
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Grand Rapids 2, Mich.
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Chicago 39, Ill.
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Detroit 27, Mich.
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Stanley Tools
New Britain, Conn.
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Grand Rapids 2, Mich.
G. A. Pratt Co.
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1714 N. Salina St.
Syracuse 8, New York
Skilsaw, Inc.
5033 Elston Ave.
Chicago 30, Ill.

GRINDERS, PORTABLE ELECTRIC

Brodhead-Garrett Co.
4560 E. 71st St.
Cleveland 5, Ohio
The Brown-Brockmeyer Co.
Dayton 1, Ohio
Chicago Wheel & Mfg. Co.
1101 W. Monroe St.
Chicago 7, Ill.
Duro Metal Products Co.
2649 N. Kildare Ave.
Chicago 18, Ill.
Foredom Electric Co.
27 Park Place
New York 7, N. Y.
R. K. LeBlond Machine Tool Co.
Madison & Edwards Rd.
Cincinnati 8, Ohio
Mall Tool Co.
7825 S. Chicago Ave.
Chicago 19, Ill.
Porter-Cable Mach. Co.
1714 N. Salina St.
Syracuse 8, N. Y.
Skilsaw, Inc.
5033 Elston Ave.
Chicago 30, Ill.
Speedway Mfg. Co.
1834 S. 52nd Ave.
Cicero, Ill.
Stanley Electric Tool Div.
New Britain, Conn.
Walker-Turner Div.
Kearney & Trecker Corp.
Plainfield, N. J.

GRINDERS, PRODUCTION, SURFACE, AND TOOL

(see also grinders, portable: grinders, toolpost)

Atlas Press Co.
1936 N. Pitcher St.
Kalamazoo, Mich.
Baice-Crane Co.
930 Central Ave.
Toledo 6, Ohio
Brodhead-Garrett Co.
4560 E. 71st St.
Cleveland 5, Ohio
The Brown-Brockmeyer Co.
Dayton 1, Ohio
Chicago Wheel & Mfg. Co.
1101 West Monroe
Chicago 7, Illinois
Cincinnati Milling & Grinding Machine, Inc.
4701 Marburg Ave.
Cincinnati 9, Ohio
Delta-Power Tool Div.
Rockwell Mfg. Co.
600 E. Vienna Ave.
Milwaukee 1, Wis.
Duro Metal Products Co.
2649 N. Kildare Ave.
Chicago 39, Ill.
Howard & Smith, Inc.
14255 Schaefer Rd.
Detroit 27, Mich.
Kearney & Trecker Corp.
6784 W. National Ave.
Milwaukee 14, Wis.
R. K. LeBlond Machine Tool Co.
Madison & Edwards Rd.
Cincinnati 8, Ohio
Lima Electric Motor Co.
Lima, Ohio
Millers Falls Co.
Greenfield, Mass.
Oliver Machinery Co.
1025 Clancy Ave., NE.
Grand Rapids 2, Mich.
Porter-Cable Machine Co.
1714 N. Salina St.
Syracuse, N. Y.
Stanley Tools
New Britain, Conn.
Walker-Turner Div.
Kearney & Trecker Corp.
Plainfield, N. J.
J. D. Wallace Co.
134 S. California Ave.
Chicago, Ill.

GRINDERS, TOOLPOST

Atlas Press Co.
1936 N. Pitcher St.
Kalamazoo, Mich.
Delta-Power Tool Div.
Rockwell Mfg. Co.
600 E. Vienna Ave.
Milwaukee 1, Wis.
Duro Metal Products Co.
2649 N. Kildare Ave.
Chicago 39, Ill.
South Bend Lathe Works
425 E. Madison St.
South Bend 22, Ind.
Stanley Electric Tool Div.
New Britain, Conn.

HACKSAWS, HAND

(see also hand tools)

Amer. Handicrafts Co., Inc.
45-49 S. Harrison St.
East Orange, N. J.
E. C. Atkins & Co.
402 S. Illinois St.
Indianapolis 9, Ind.
Brodhead-Garrett Co.
4560 E. 71st St.
Cleveland 5, Ohio
Henry Disston & Sons, Inc.
Tacony, Phil. 35, Pa.
Millers Falls Co.
Greenfield, Mass.
Proto Tools
2209 Santa Fe Ave.
Los Angeles 54, Calif.
L. S. Starrett Co.
Crescent St.,
Athol, Mass.

HACKSAWS, POWER

E. C. Atkins & Co.
402 S. Illinois St.
Indianapolis 9, Ind.
Henry Disston & Sons, Inc.
Tacony, Phil. 35, Pa.
Howard & Smith, Inc.
14255 Schaefer Rd.
Detroit 27, Mich.
L-W Chuck Co.
24 St. Clair St.
Toledo, Ohio
The L. S. Starrett Co.
Athol, Mass.
Wells Mfg. Corp.
2600 Shop Ave.
Three Rivers, Mich.

HAMMERS, METALWORKING

Amer. Handicrafts Co., Inc.
45-49 S. Harrison St.
East Orange, N. J.
Metal Crafts Supply Co.
10 Thomas St.
Providence 3, R. I.
Millers Falls Co.
Greenfield, Mass.
Proto Tools
2209 Santa Fe Ave
Los Angeles 54, Calif.
Fayette R. Plumb, Inc.
4837 James St.
Philadelphia 37, Pa.
Stanley Tools
New Britain, Conn.

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New Britain, Conn.

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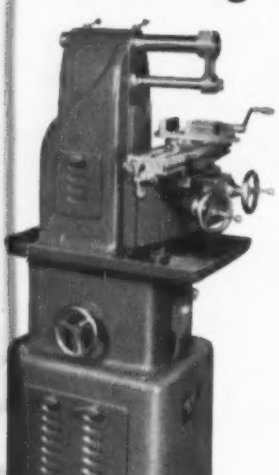

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Indianapolis 9, Ind.

Brodhead-Garrett Co.
4560 E. 71st St.
Cleveland 5, Ohio

R. Colaw aerts Co., Inc.
1 W. 67th St.
New York 23, N. Y.

Chicago Wheel & Mfg. Co.
1101 W. Monroe St.
Chicago 7, Ill.

The Cincinnati Tool Co.
4059 Montgomery Rd.
Cincinnati 12, Ohio

Howard & Smith, Inc.
14255 Schaefer Rd.
Detroit 27, Mich.

Lufkin Rule Co.
1730 Hess Ave.
Saginaw, Mich.

Millers Falls Co.
57 Wells St.
Greenfield, Mass.

North Bros. Mfg. Co.
Lehigh & American
Philadelphia 33, Pa.

Proto Tools
2206 Santa Fe Ave.
Los Angeles 54, Calif.

Fayette R. Plumb, Inc.
4837 James St.
Philadelphia 37, Pa.

Skilsaw, Inc.
5033 Elston Ave.
Chicago 30, Ill.

Stanley Tools
New Britain, Conn.

L. S. Starrett Co.
Crescent St.
Athol, Mass.

J. H. Williams & Co.
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Buffalo 7, N. Y.

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Hartford 1, Conn.

Brodhead-Garrett Co.
4560 E. 71st St.
Cleveland 5, Ohio

Chicago Wheel & Mfg. Co.
1101 W. Monroe St.
Chicago 7, Ill.

The Cincinnati Tool Co.
4059 Montgomery Rd.
Cincinnati 12, Ohio

Henry Disston & Sons, Inc.
Tacony, Phil. 35, Pa.

Duro Metal Products Co.
2649 N. Kildare Ave.
Chicago 18, Ill.

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1730 Hess Ave.
Saginaw, Mich.

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57 Wells St.
Greenfield, Mass.

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Philadelphia 33, Pa.

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355 Eighth Ave.
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2209 Santa Fe Ave.
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Philadelphia 37, Pa.

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L. S. Starrett Co.
Crescent St.
Athol, Mass.

Utica Drop Forge & Tool Corp.
2415 Whitesboro St.
Utica 4, N. Y.

Weller Manufacturing Co.
827 Packer St.
Easton, Pa.

J. H. Williams & Co.
400 Vulcan St.
Buffalo 7, N. Y.

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Chicago 22, Illinois

American Handicrafts Co., Inc.
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East Orange, N. J.

E. C. Atkins & Co.
402 S. Illinois St.
Indianapolis 9, Ind.

Brodhead-Garrett Co.
4560 E. 71st St.
Cleveland 5, Ohio

Chicago Wheel & Mfg. Co.
1101 W. Monroe St.
Chicago 7, Ill.

The Cincinnati Tool Co.
4059 Montgomery Rd.
Cincinnati 12, Ohio

Craftsman Supply House
35 Browns Ave.
Scottsville, N. Y.

Craftsman Wood Service Co.
2727 S. Mary St.
Chicago 8, Ill.

Henry Disston & Sons
Tacony, Phil. 35, Pa.

Duro Metal Products Co.
2649 N. Kildare Ave.
Chicago 18, Ill.

William Dixon, Inc.
32 E. Kinney St.
Newark 1, N. J.

Greenlee Tool Co.
2136 Twelfth St.
Rockford, Ill.

The Lufkin Rule Co.
1730 Hess St.
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Millers Falls Co.
Greenfield, Mass.

North Brothers Mfg. Co.
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Philadelphia 33, Pa.

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5033 Elston Ave.
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Crescent Street
Athol, Mass.

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Brodhead-Garrett Co.
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Cleveland 5, Ohio

Henry Disston & Sons, Inc.
Tacony, Phil. 35, Pa.

The Gearon Co.
27 S. Desplaines St.
Chicago 6, Illinois

Gyro Lamp & Shade Corp.
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Chicago 40, Ill.

Hobbywoods
1305 Eastern Ave.
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(see saws, jigs)

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Brodhead-Garrett Co.
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Cleveland 5, Ohio

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337 University Ave.
Rochester 7, N.Y.

Osborn Bros. Supply Co.
223 W. Jackson Blvd.
Chicago 6, Ill.

X-acto Crescent Products Co.
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New York 16, N. Y.

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Atlas Press Co.
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Kalamazoo, Mich.

Cincinnati Lathe & Tool Co.
3207 Disney
Oakley, Cincinnati 9, Ohio

Howard & Smith, Inc.
14255 Schaefer Rd.
Detroit 27, Mich.

R. K. LeBlond Machine Tool Co.
Madison & Edwards Rd.
Cincinnati 8, Ohio

Logan Engineering Co.
4801 W. Lawrence Ave.
Chicago 30, Ill.

Sheldon Machine Co.
4240 N. Knox Ave.
Chicago 41, Illinois

South Bend Lathe Works
425 E. Madison St.
South Bend 22, Ind.

LATHES, TURRET

(includes screw machines)

R. K. LeBlond Machine Tool Co.
Madison & Edwards Rds.
Cincinnati 8, Ohio

Logan Engineering Co.
4801 W. Lawrence Ave.
Chicago 30, Ill.

Sheldon Machine Co., Inc.
4240 N. Knox Ave.
Chicago 41, Illinois

South Bend Lathe Works
425 E. Madison St.
South Bend 22, Ind.

LATHES, WOODWORKING

Atlas Press Co.
1936 N. Pitcher St.
Kalamazoo, Mich.

Boice-Crane Co.
930 Central Ave.
Toledo 6, Ohio

Brodhead-Garrett Co.
4560 E. 71st St.
Cleveland 5, Ohio

Delta-Power Tool Div. Rockwell Mfg. Co.
600 E. Vienna Ave.
Milwaukee 1, Wis.

Duro Metal Prod. Co.
2649 N. Kildare Ave.
Chicago 39, Ill.

Howard & Smith, Inc.
14255 Schaefer Rd.
Detroit 27, Mich.

Magna Engineering Corp.
417 Montgomery St.
San Francisco 4, Calif.

Millers Falls Co.
Greenfield, Mass.

Oliver Machinery Co.
1025 Clancy Ave., N.E.
Grand Rapids 2, Mich.

Walker-Turner Div. Kearney & Trecker Corp.
Plainfield, N. J.

J. D. Wallace Co.
170 S. California Ave.
Chicago 12, Ill.

LEVELS

Henry Disston & Sons
Tacony, Phil. 35, Pa.

Millers Falls Co.
Greenfield, Mass.

South Bend Lathe Works
425 E. Madison St.
South Bend 22, Ind.

Stanley Tools
New Britain, Conn.

The L. S. Starrett Co.
Crescent Street
Athol, Mass.

LUMBER

(see also woodshop supplies)

Brodhead-Garrett Co.
4560 E. 71st St.
Cleveland 5, Ohio

Craftsman Wood Service Co.
2729 S. Mary St.
Chicago 8, Ill.

Douglas Fir Plywood Assn.
Tacoma Bldg.
Tacoma 2, Wash.

Hobbywoods
1305 Eastern Ave.
Baltimore 3, Md.

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Kalamazoo, Mich.

Boice-Crane Co.
938 Central Ave.
Toledo 6, Ohio

Brodhead-Garrett Co., Inc.
4560 E. 71st St.
Cleveland 5, Ohio

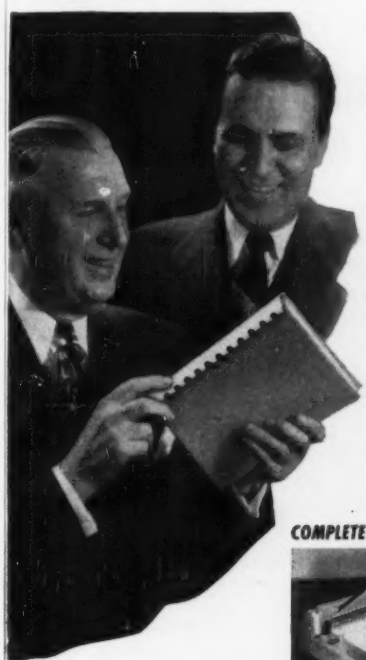
Burke Machine Tool Co.
26 E. 72nd St.
Cincinnati 16, Ohio

Canedy-Otto Div., Cincinnati Lathe & Tool Co.
3207 Disney Ave.
Cincinnati 9, Ohio

Canvas Products Corp.
Box No. 1
Fond du Lac, Wis.

Challenge Machinery Co.
Grand Haven, Mich.

Cincinnati Lathe & Tool Co.
3207 Disney Ave.
Oakley, Cincinnati 9, Ohio



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Cincinnati 25, Ohio

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620 Seventh St.
Grand Haven, Mich.

Delta-Power Tool Div. Rockwell Mfg. Co.
600 E. Vienna Ave.
Milwaukee 1, Wis.

Howard & Smith, Inc.
14255 Schaefer Rd.
Detroit 27, Mich.

Kearney & Trecker Corp.
6784 W. National Ave.
Milwaukee 14, Wis.

The R. K. LeBlond Mach. Tool Co.
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Cincinnati 8, Ohio

Lima Electric Motor Co.
Lima, Ohio

Logan Engineering Co.
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Chicago 30, Ill.

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Saginaw, Mich.

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414 Ford Bldg.
Detroit 26, Mich.

E. H. Sheldon & Co.
Muskegon, Mich.

Sheldon Machine Co., Inc.
4248 N. Knox Ave.
Chicago 41, Ill.

Skilsaw, Inc.
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Chicago 30, Ill.

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South Bend 22, Ind.

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Athol, Mass.

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Toledo 6, Ohio

Brodhead-Garrett Co.
4560 E. 71st St.
Cleveland 5, Ohio

Cincinnati Lathe & Tool Co.
3207 Disney Ave.
Cincinnati 9, Ohio

Cincinnati Milling & Grinding Machines, Inc.
470 Marburg Ave.
Cincinnati 9, Ohio

Delta-Power Tool Div. Rockwell Mfg. Co.
600 E. Vienna Ave.
Milwaukee 1, Wis.

Duro Metal Products Co.
2649 N. Kildare Ave.
Chicago 1, Ill.

Howard & Smith, Inc.
14255 Schaefer Rd.
Detroit 27, Mich.

Kearney & Trecker Corp.
6784 W. National Ave.
Milwaukee 14, Wis.

R. K. LeBlond Machine Tool Co.
Madison & Edwards Rd.
Cincinnati 8, Ohio

Lima Electric Motor Co.
Lima, Ohio

Logan Engineering Co.
4801 W. Lawrence Ave.
Chicago 30, Ill.

L-W Chuck Co.
24 St. Clair St.
Toledo, Ohio

Marvin Machine Products, Inc.
414 Ford Bldg.
Detroit 26, Mich.

Sheldon Machine Co., Inc.
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Chicago 41, Ill.

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South Bend 22, Ind.

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Toledo 6, Ohio

Brodhead-Garrett Co.
4560 E. 71st St.
Cleveland 5, Ohio

Howard & Smith, Inc.
14255 Schaefer Rd.
Detroit 27, Mich.

Metal Crafts Supply Co.
10 Thomas St.
Providence 3, R. I.

Metal Goods Corp.
5239 Brown Ave.
St. Louis 15, Mo.

Metal Supply, Inc.
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Saginaw, Mich.

Millers Falls Co.
Greenfield, Mass.

L. S. Starrett Co.
Crescent Street
Athol, Mass.

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Atlas Press Co.
1936 N. Pitcher St.
Kalamazoo, Mich.

Burke Machine Tool Co.
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Cincinnati 16, Ohio

Cincinnati Milling & Grinding Machines, Inc.
4701 Marburg Ave.
Cincinnati 9, Ohio

Kearney & Trecker Corp.
6784 W. Nat'l Ave.
Milwaukee 14, Wis.

L-W Chuck Co.
24 St. Clair St.
Toledo, Ohio

Marvin Machine Products, Inc.
414 Ford Bldg.
Detroit 26, Mich.

Sheldon Machine Co., Inc.
4258 N. Knox Ave.
Chicago 41, Ill.

MORTISERS, WOODWORKING

Boice-Crane Co.
930 Central Ave.
Toledo 6, Ohio

Delta-Power Tool Div. Rockwell Mfg. Co.
600 E. Vienna Ave.
Milwaukee 1, Wis.

Duro Metal Products Co.
2649 N. Kildare Ave.
Chicago 18, Ill.

Greenlee Bros. & Co.
2136 Twelfth St.
Rockford, Ill.

Oliver Machinery Co.
1025 Clancy Ave., NE
Grand Rapids 2, Mich.

Porter-Cable Machine Co.
1714 N. Salina St.
Syracuse 8, N. Y.

Stanley Electric Tool Div.
The Stanley Works
New Britain, Conn.

Walker-Turner Div. Kearney & Trecker Corp.
Plainfield, N. J.

J. D. Wallace Co.
170 S. California Ave.
Chicago 12, Ill.

MOTORS, ELECTRIC

Atlas Press Co.
1936 N. Pitcher St.
Kalamazoo, Mich.

Boice-Crane Co.
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Toledo 6, Ohio

Brodhead-Garrett Co., Inc.
4560 E. 71st St.
Cleveland 5, Ohio

The Brown-Brockmeyer Co.
Dayton 1, Ohio

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Lima, Ohio

Walker-Turner Div. Kearney & Trecker Corp.
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Cleveland 5, Ohio

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Brodhead-Garrett Co., Inc.
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Cleveland 5, Ohio

General Finishes Sales & Service
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Milwaukee 46, Wis.

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Indianapolis 9, Ind.

Atlas Press Co.
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Kalamazoo, Mich.

Boice-Crane Co.
930 Central Ave.
Toledo 6, Ohio

Brodhead-Garrett Co.
4560 E. 71st St.
Cleveland 5, Ohio

Bass Machine Works
Holland, Mich.

Delta-Crescent Power Tool Div. Rockwell Mfg. Co.
600 E. Vienna Ave.
Milwaukee 1, Wis.

Duro Metal Prod. Co.
2649 N. Kildare Ave.
Chicago 39, Ill.

Greenlee Bros. & Co.
2136 Twelfth St.
Rockford, Ill.

Howard & Smith, Inc.
14255 Schaefer Rd.
Detroit 27, Mich.

Mall Tool Co.
7740 S. Chicago Ave.
Chicago 19, Ill.

Oliver Machinery Co.
1025 Clancy Ave., NE
Grand Rapids 2, Mich.

Parks Woodworking Machine Co.
1501 Knowlton St.
Cincinnati, Ohio

The Porter-Cable Machine Co.
1714 N. Salina St.
Syracuse 8, N. Y.

Walker-Turner Div. Kearney & Trecker Corp.
Plainfield, N. J.

J. D. Wallace Co.
170 S. California Ave.
Chicago 12, Ill.

PLANES, HAND

Craftsman Wood Service Co.
2727 S. Mary St.
Chicago 8, Ill.

Mall Tool Co.
7740 S. Chicago Ave.
Chicago 19, Ill.

Millers Falls Co.
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The Porter-Cable Machine Co.
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Detroit 2, Mich.

D. W. Cope—Plastics
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St. Louis 21, Mo.

Craft Service
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Rochester 7, N. Y.

Craftsman Supply Hse.
35 Browns Ave.
Scottsville, New York

Craftsman Wood Service Co.
2727 S. Mary St.
Chicago 8, Ill.

Petersen Bros.
3823 N. Southport Ave.
Chicago 13, Ill.

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St. Louis 10, Mo.

Plastic Products Co.
371 S. Main St.
Salt Lake City 11, Utah

Plastic Supply Co.
2901 N. Grand Blvd.
St. Louis 7, Mo.

PLIERS

Utica Drop Forge & Tool Corp.
2415 Whitesboro St.
Utica 4, N. Y.

PLYWOOD
(see also lumber)

Brodhead-Garrett Co.
4560 E. 71st St.
Cleveland 5, Ohio

Craftsman Wood Service Co.
2727 S. Mary St.
Chicago 8, Ill.

Douglas Fir Plywood Assn.
301 Tacoma Bldg.
Tacoma 2, Wash.

Hobbywoods
1305 Eastern Ave.
Baltimore 3, Md.

U. S. Plywood Corp.
55 W. 44th St.
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PORTABLE ELECTRIC TOOLS
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East Orange, N. J.

Brodhead-Garrett Co.
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Cleveland 5, Ohio

Chicago Wheel & Mfg. Co.
1101 W. Monroe St.
Chicago 7, Ill.

Duro Metal Prod. Co.
2649 N. Kildare Ave.
Chicago 39, Ill.

Foredom Electric Co.
27 Park Pl.
New York 7, N. Y.

Howard & Smith, Inc.
14255 Schaefer Rd.
Detroit 27, Mich.

Mall Tool Co.
7825 S. Chicago Ave.
Chicago 19, Ill.

Millers Falls Co.
57 Wells St.
Greenfield, Mass.

Plastic Parts & Sales
1157 S. Kingshiway
St. Louis 10, Mo.

Plastic Products Co.
371 S. Main St.
Salt Lake City 11, Utah

Plastic Supply Co.
2901 N. Grand Blvd.
St. Louis 7, Mo.

Porter-Cable Machine Co.
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Syracuse 8, N. Y.

Skilsaw, Inc.
5033 Elston Ave.
Chicago 30, Ill.

Speedway Mfg. Co.
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The Stanley Works
New Britain, Conn.

J. D. Wallace Co.
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Chicago 12, Ill.

Weller Manufacturing Co.
827 Packer St.
Easton, Pa.

PRECISION EQPT.
(see also measuring tools)

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Cleveland 5, Ohio

The Lufkin Rule Co.
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Saginaw, Mich.

O'Neil-Irwin Mfg. Co.
Lake City, Minn.

The Sheffield Corp.
721 Springfield St.
Dayton 3, Ohio

The L. S. Starrett Co.
Crescent St.
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Grand Haven, Mich.

Sheldon Machine Co.
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Chicago 41, Ill.

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Elizabeth 8, N. J.

PRINTING EQPT. AND TYPES

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G. A. Pratt Co.
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Boyce-Roche Book Co.
Caldwell, N.J.

Coyne Electrical School
Education Book Publishing Division
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Goodheart-Willcox Co.
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New York 3, N. Y.

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Cincinnati 12, Ohio

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Millers Falls Co.
Greenfield, Mass.

O'Neil-Irwin Mfg. Co.
Lake City, Minn.

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2209 Santa Fe Ave.
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Stanley Tools
New Britain, Conn.

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Crescent St.
Athol, Mass.

J. H. Williams & Co.
400 Vulcan St.
Buffalo 7, N.Y.

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Chicago 7, Ill.

Ohmite Mfg. Co.
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Chicago 44, Ill.

Howard W. Sams & Co.
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Indianapolis 5, Ind.

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Walker-Turner Div. Kearney & Trecker Corp.
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Cleveland 5, Ohio

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Chicago 7, Ill.

Craftsman Wood Service Co.
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Chicago 8, Ill.

Duro Metal Products Co.
2649 N. Kildare Ave.
Chicago, Ill.

Howard & Smith, Inc.
14255 Schaefer Rd.
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Madison & Edwards Rd.
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Grand Rapids 2, Mich.

Onsrud Machine Works Inc.
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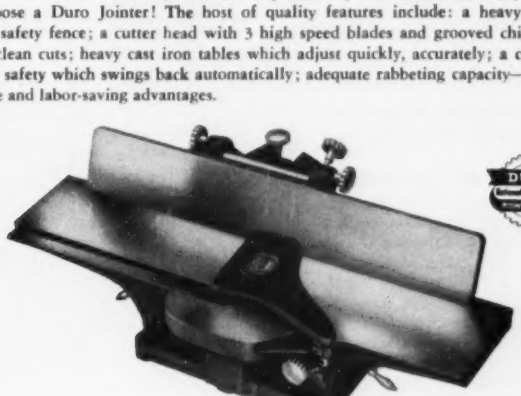

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Holland, Mich.
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Chicago 39, Ill.
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Grand Rapids 2, Mich.
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Syracuse 8, N. Y.
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New Britain, Conn.
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Chicago 12, Ill.
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New York 16, N. Y.

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Cleveland 5, Ohio
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Crescent Street
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Oliver Machinery Co.
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Chicago 8, Ill.
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Milwaukee 1, Wis.
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Tacony, Phila. 35, Pa.
Duro Metal Prod. Co.
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Toledo 6, Ohio
Henry Disston & Sons, Inc.
Tacony, Phil. 35, Pa.
Oliver Machinery Co.
1025 Clancy Ave., NE
Grand Rapids 2, Mich.

SAWS
(see also hacksaws)

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Millers Falls Co.
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Stanley Tools
New Britain, Conn.

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12" throat capacity. Cuts odd shapes. Does straight or scroll work.

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Bends sheets and makes simple metal trim.

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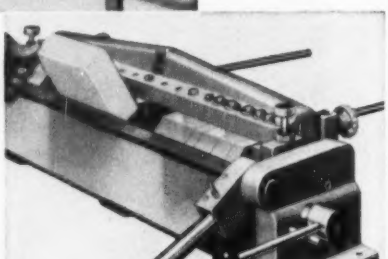

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Stanley Tools
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Athol, Mass.
J. H. Williams & Co.
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Greenfield, Mass.
Proto Tools
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Stanley Tools
New Britain, Conn.

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The Porter-Cable Machine Co.
1714 N. Salina St.
Syracuse 8, N. Y.
Stanley Electric Tool Div.
New Britain, Conn.
Walker-Turner Div. Kearney & Trecker Corp.
Plainfield, N. J.
J. D. Wallace Co.
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Chicago 12, Ill.

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Stanley Tools
New Britain, Conn.
Weller Manufacturing Co.
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Providence 3, R. I.
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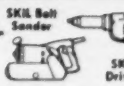
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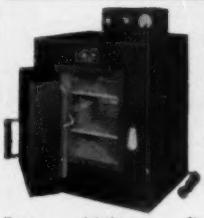

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Arts and Craftwork

You Can Make Jewelry (I, II); *Native Crafts; Art Is Everywhere; Ceramics; Leatherwork and Whittling; American Braiding Craft; Laying Out, Cutting, Filing, and Drilling; Bending and "Beating Down" Metal; Raising and Surface Decoration;* and *Jointing and Finishing Art Metal* are new filmstrips available for $3 each from Chas. A. Bennett Co., Inc., Peoria 3, Ill.

Automotive

Automobile Engine Tune-Up Chart is a 24 x 36-inch chart printed on heavy paper, illustrated with cut-away view of engine, carburetor, distributor, and other units requiring tune-up adjustments. Detailed instructions show how to do a systematic tune-up job. Produced and sold by B. M. Ikert, 53 W. Jackson Blvd., Chicago 4, Ill., for $1 each.

Basic Methods of Automobile Refinishing is a new slide film (running time 12 minutes) designed for student instruction in vocational schools. It is available for showing to all interested groups from Automotive Division, The Sherwin-Williams Co., 101 Prospect Ave., Cleveland 1, Ohio.

The Human Bridge is a film which traces the production of a Ford car from drawing board to assembly line. Write Community Relations Department, Ford Motor Co., Dearborn, Mich., or see your local dealer.

Catalog of Motion Pictures is the 11th edition of General Motors' 16mm sound films. For the catalog write General Motors Public Relations Department, General Motors Building, Detroit 2, Mich.

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Color Card Cardboard Base for Drawing Ink Bottle. Pie-cut lines indicating primary and secondary colors are cut to hold bottle. Available from Higgins Ink Co. dealers.

Electricity and Radio

Suggestions for Teaching Selected Material from the Field of Electricity (Monograph No. 3) large wall charts for classroom use, and small wall charts for student use are all available from the Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N.J.

Motion Pictures for School Use is a 24-page catalog released by the School Service Department, Westinghouse Electric Corp., Box 1017, 306 Fourth Ave., Pittsburgh 30, Pa.

Graphic Arts

Elements of Design: Composition is the fourth of a series of one-reel teaching films on basic design principles. For rental information, see your local film library. Sold by Young America Films, Inc., 18 E. 41st St., New York 17, N.Y.

Locking Up Type Forms for the Platen Press is a series of 25 color slides produced by Adrian Pollock, a printing teacher. For information, write him at 273 E. Troy St., Ferndale, Mich.

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Better Use of Leisure Time, Planning for Success, Developing Self-Reliance. Same as above.

Film Index

An Index Guide to Free Educational and Classroom Films from Industry is a catalog prepared by the Modern Talking Picture Service, 9 Rockefeller Plaza, New York 20, N.Y.

Machine Shop and Metalworking

Benchwork Tools and Procedures is a series of 10 discussional-type slide-films offered by the Jam Handy Organization, 2821 E. Grand Boulevard, Detroit 11, Mich.

School Shop Machinery—Three-Dimensional Scale Models. These ½" to the foot models for planning the school shop can either be borrowed for 60 days or bought from Yates-American Machine Co., Beloit, Wis.

Student Plan Sheets for Industrial Arts are available at 50c per 100 from Walker-Turner Division, Kearney & Trecker Corp., South Ave., Plainfield, N.J. Charts on *How to Use Grinder, How to Use Band Saw,* and *How to Use Drill Press* are also available.

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Men and Oil is a brief documentary film on petroleum from discovery of oil fields through refining. Available free from Modern Talking Picture Service, 142 E. Ontario St., Chicago 11, Ill.

Motion Picture Catalog contains information on films about oil and scientific refining principles which may be borrowed by responsible groups. Write Shell Public Relations Department, 50 W. 50th St., New York 20, N.Y.

This Is Oil is a series of colorful charts on petroleum which may be used alone or with the motion picture of the same title. Write Shell Oil Co., 50 W. 50th St., New York 20, N.Y.

Plastics

Making a Plastic Fruit Bowl is a 15-minute sound color film showing the elementary steps in working plastics, produced by the Information Service and Industrial Education Departments of Iowa State College, Ames. Write John Litherland, 220 Curtiss Hall, or the Ind. Ed. Dept. for distribution schedules and rentals.

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Functional Photography in Industry is a 3½-reel sound motion picture, color with black and white sequences. 16 mm. Available from Eastman Kodak Co., Industrial Photographic Division, 343 State St., Rochester 4, N.Y.

Time-Lapse Photography is a 10-minute 16mm sound color film explaining this process. $90. Daily rental fee, $5. John Ott, 730 Elm St., Winnetka, Ill.

Program Planning

Setting Up Your Audio-Visual Education Program is a handbook prepared for California secondary-school principals by the Society for Visual Education, Inc., 1345 W. Diversey Parkway, Chicago 14, Ill. $1.

Safety

Screw Drivers and Screw Jays, popular 16mm highway safety film, has been modernized and reissued in cooperation with the National Safety Council by the Shell Oil Co., Public Relations Department, 50 W. 50th St., New York 20, N.Y., or 100 Bush St., San Francisco, Calif. Free.

Training

The Easier Way is a two-reel, 16mm sound motion picture on motion study produced by the Jam Handy Organization. Write James Craig, Film Section, General Motors Corp., 9-252 General Motors Building, Detroit 2, Mich.

Supervisory and Foreman Training is a series of five sound films with correlated record offered by the Jam Handy Organization, 2821 E. Grand Boulevard, Detroit 11, Mich.

Welding

Welding Comes to the Farm, The Magic Wand of Industry, The Prevention and Control of Distortion in Arc Welding, and *Designing Machinery for Arc Welding* are all 16mm sound motion pictures available from The Lincoln Electric Co., 12818 Coit Road, Cleveland 1, Ohio.

Woodworking

The Story of the Forests is a film strip produced by the American Forest Products Industries, a subsidiary of the National Lumber Manufacturers' Association, 1319 Eighteenth St., N.W., Washington 6, D.C. It will be loaned to schools on requests made to the Board for Vocational Education, 216 E. Monroe St., Springfield, Ill.

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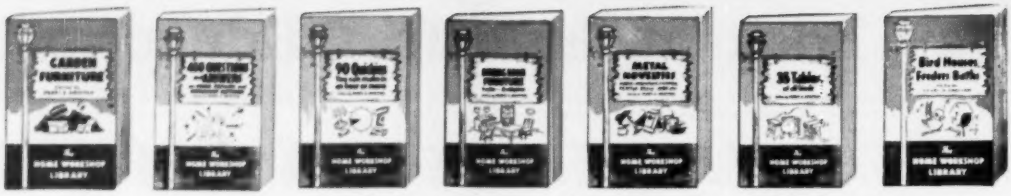

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Development of Vocational Education. Hawkins, Prosser, Wright. American Technical Society. In press.

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Vocational Education: America's Greatest Resource. McCarthy. American Technical Society. $5.75.

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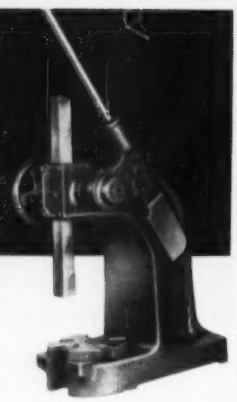

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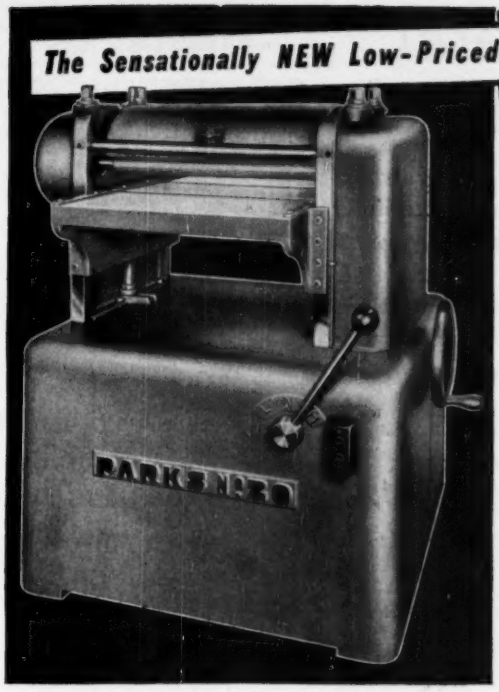

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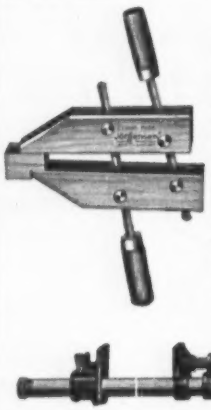

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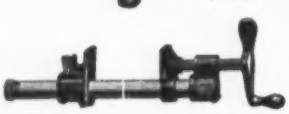

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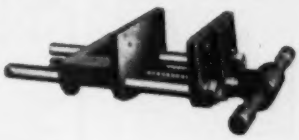

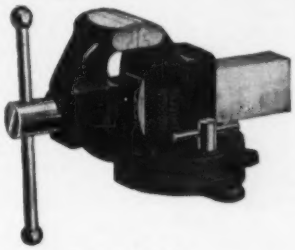

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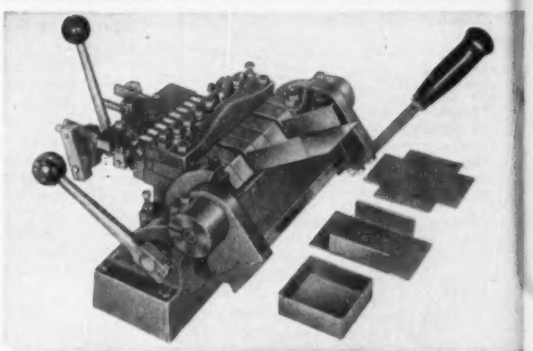

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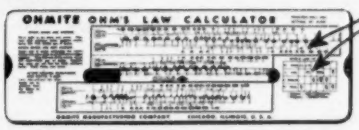

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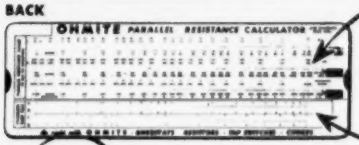

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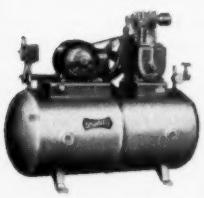

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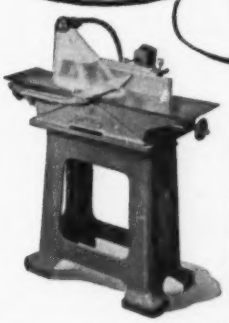

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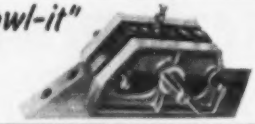

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Earl M. Bowler, trade and industrial teacher trainer, University of Texas, Austin 12.

Charles Cyrus, trade and industrial teacher trainer, University of Texas, Austin 12.

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Lorenzo E. Peterson, trade and industrial teacher trainer, Weber College, Ogden.

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Algot E. Anderson, state director of industrial arts, Salt Lake City 1.

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Washington . . . . *from page 96*

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Irony.—A number of Congressional friends of vocational education feel that the George-Barden Act funds might not have been cut ten million dollars—which is proposed to be spent by another agency—if education's battles could be fought by an officer of cabinet rank. If this view is sound it is real irony, since NEA, among others, opposed the reorganization plan which would have elevated Federal Security Agency to departmental level and given Administrator Oscar Ewing cabinet rank.

Shop Training Battle.—Amid charges of waste in World War II training, a fierce underground battle has been going on in official Washington over the question of where defense training will be conducted. The battle, according to reliable sources, is between some members of industry and some sponsors of independent schools, and those who favor the wartime method of training in school shops.

It headed up in the Budget Bureau where Office of Education's request for emergency funds languished for weeks while requests piled up.

Adverse contention is that training can be done more efficiently and even at less cost by industry itself, through its own facilities and by private contract, than through the schools.

A number of firms are reported to have been insisting on a "2 percent" provision for training, in defense contracts, on the basis of this contention.

School shop advocates, of course, insist that this is ridiculous.

The issues are:

One of the main arguments advanced against the school shops is that many of those trained in World War II were not placed in industry.

In reply to this argument, proponents of the school shop system point out that at the beginning of the last training program there were many unemployed and an out-of-school youth program was obligatory.

Many of the young men who were trained under this program, it is pointed out, later were drafted, and were able to use their acquired skills in the armed services.

In regard to the economy argument, it is pointed out that school shop training costs about 30 cents an hour per student, whereas industry estimates range up to $1.25 per hour.

Furthermore it is pointed out, during the peak year, only $94 million was spent by the Office of Education in training activities. Two percent of the $10 billion emergency fund would be $200 million, over half of what was spent by the Office of Education in the whole six years before.

There is no disagreement over training by industries which are equipped to do their own. However, there is a fear that if the "2 per cent" clause is carried out on a wide basis, a lot of fly-by-night concerns will "clean up" and a lot of small industries which have no adequate training facilities will be caught short.

Asked to comment on the situation, AVA's new Executive Secretary, M. D. Mobley, said:

"Many officials in a position to know think it would be an utter waste of funds to set up and equip additional private training facilities at public expense when there are already in existence vocational training facilities capable of doing a bigger and more efficient training job than was done during World War II, when more than 11 million workers were trained for war-essential jobs."

Meantime, officials of the Office of Education report that hardly a day passes but that additional evidence is received of the need for emergency training.

Vocational Education Strengthened.—A strengthened Division of Vocational Education is seen by Commissioner Earl J. McGrath as resulting from a new overhauling and streamlining of the entire Office of Education.

One result which it is felt will strengthen the Vocational Education Division is the tightening of the organizational structure to only three divisions, of which Vocational Education is one, rather than having 8 divisions as formerly.

McGrath is said to feel that this set-up will enable the Education Office to concentrate more on the major objectives which he outlined rather than scattering its shots.

The new units, each headed by an Assistant Commissioner, are: Division of State and Local Schools, the Division of Vocational Education, and the Division of Higher Education.

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Plans and Grants Branch, Agricultural Education Branch, Trade and Industrial Education Branch, Home Economics Education Branch, Business Education Branch, and Guidance and Counseling Branch.

Whereas officials of the divisions whose activities were subordinated in the transfer are said to be concerned about the effectiveness of their programs, those of the Vocational Education Division are said to be well satisfied with the new arrangement.

Raymond W. Gregory will continue as Assistant Commissioner for Vocational Education.

Industrial Arts in the USOE.—Much concern is felt in industrial-arts circles over the statement made by the Public Administration Survey group from Chicago, which made the report on which the Office of Education reorganization was based, that specialists in subject-matter fields be employed "only on a temporary basis for the purpose of providing needed stimulus to neglected areas." This opens up the question of whether or not an industrial-arts specialist should continue to operate as such in the Office. There undoubtedly would be great dissatisfaction among industrial-arts people if the services of a specialist were to be curtailed, especially since a single specialist is at present unable to perform all of the service tasks requested because of time and budgetary limitations.

AVA Group Meets.—Plans for a number of publications for members of the American Vocational Association and for unifying all groups interested in the advancement of industrial-arts education were discussed by the Industrial Arts policies and Planning committee of that organization in AVA headquarters here recently.

M. D. Mobley, AVA Executive Secretary; and John R. Ludington, industrial-arts specialist, U.S. Office of Education, both pointed out that teachers should encourage high-school boys to remain in school, as recommended by the Defense Department's committee on education liasion. Qualified youths, they said, should intensify their studies of mathematics, science, and shop courses, since each of the armed services prefers men well-grounded in these fields so that they may better adapt themselves to the special needs of the services. It was revealed that the Defense Department will release this summer a guidance bulletin for 17-year-old boys on the vocational possibilities in each of the armed services.

AVA publications discussed were: a newsletter, newspaper, or yearbook; a new bulletin to replace *Improving Instruction in Industrial Arts*, now several years old; a revision of the service leaflet on industrial arts; a rewriting of the bulletin, *State Supervision*, under the new title, "State and Local Supervision"; and a series of articles on the structure of industrial arts in the *AV Journal*.

For the Minneapolis convention this fall, the committee appointed Homer J. Smith, professor of industrial education, University of Minnesota, Minneapolis, industrial-arts program chairman; and William C. Krause, president of the Minnesota Industrial Arts Association, co-chairman.

Shriver L. Coover, director of the industrial-arts department, State Teachers College, California, Pa., was chairman of the meeting.

Production Authority Lifts Building Ban.—If you have held back on planning that new school or shop addition because of the National Production Authority ban on construction costing more than $5000 you can start work on the project again. The NPA has lifted restrictions on the construction of certain commercial and recreational facilities including schools so that special authorization is no longer required. Apparently the strategic supplies situation has eased to the extent that this type of construction can now be carried on, at least as far as schools and certain other types of buildings are concerned.

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News

HAPPENINGS IN INDUSTRIAL EDUCATION

Supervisors to Organize

A NATIONAL council for industrial-arts supervisors will be organized at the New York City convention of the American Industrial Arts Association on May 2 at the Hotel New Yorker. The council idea is the natural outgrowth of the conviction held by many supervisors that there is a great need for close and continuous cooperation by those people charged with the responsibility for the industrial-arts program. Some of the problems which the council will work on include: teacher selection, inservice education, new curricular materials, selection of books, shop layouts, salaries, teaching aids, certification, and uniform tool and equipment specifications. All supervisors are invited to attend the organization meeting.

A national directory of persons responsible for the industrial-arts programs in cities over 20,000 is now being prepared. All those in this category are urged to send their names, addresses, and exact payroll positions to Merrill C. Hamburg, vice-president American Industrial Arts Association, 467 West Hancock Ave., Detroit 1, Michigan.

April Meetings

A NUMBER of groups are planning meetings during the month of April. Among them are the following.

The Long Island Industrial Arts and Vocational Teachers Association will hold its third annual Industrial Exposition on April 13 and 14 at Caulkins Gymnasium, Hofstra College, Hempstead, N. Y. Student projects from 50 schools will be exhibited and there will be commercial exhibits as well.

The fourth annual Industrial Education Conference of Iowa State College will be held on April 20 with meetings at the Memorial Union. Teachers and administrators are invited.

The Oswego, N. Y., State Teachers College will hold its 13th Annual Spring Conference on April 26 and 27 for shop teachers and school administrators. Exhibits, demonstrations, and talks by professional leaders highlight the conference.

The Pennsylvania Industrial Arts Conference will be held on April 27 and 28 at the State Teachers College, California, Pa. An outstanding program has been arranged for this annual meeting.

CONVENTIONS

Illinois Vocational Assoc., April 5-7, Peoria.
Texas Vocational Assoc., April 5-7, Dallas.
Connecticut Industrial Arts Assoc., April 6-7, New Britain.
New York State Vocational and Practical Arts Assoc., April 12-14, Rochester.
California Industrial Education Assoc., April 13-14, Long Beach.
Michigan Industrial Education Society, April 19-21, Grand Rapids.
American Industrial Arts Assoc., May 2-5, New York City.
Conference on Printing Education, June 17-20, Cleveland, Ohio.

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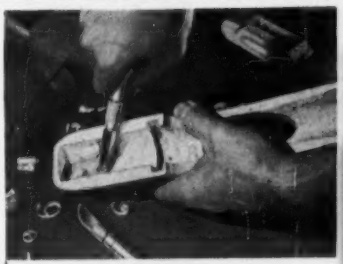

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SCHOOL SHOP
WASHINGTON BUREAU

Is Congress Relenting?—When the secret hearings of the House Appropriations Committee are finally made public, they will reveal that education in general, and vocational education in particular, are receiving a more kindly reception at the hands of committee members than they have received in recent years.

Meantime, it is reported on reliable authority, that if the House should retain the provision emasculating the George-Barden Act, Senator George himself is prepared to testify before the Senate Appropriations Committee, and even carry the battle to the floor of the Senate if necessary.

Best guess, according to insiders, for the improved receptivity of the House Committee is that the members have been hearing from the "folks back home" and that there is a growing awareness that vocational education is "getting a bum deal."

Strong protests from several powerful figures in the vocational education and related fields will be taken into consideration when Congress actually starts to mark up the bill. Although testimony before the Committee is not made public until the bill is reported, it is reliably understood that these spokesmen asked that the historic formula for the George-Barden Act be restored in the bill, and that defense-training funds come from emergency appropriations rather than from the G-B funds.

Present strategy, if the bill is reported out of Committee with the emasculating provision, is to make it the subject of a "point of order" on the floor of the House. This is possible, insiders feel, because it changes basic law, a prerogative not allocated to the Appropriations Committee. Such a move would have the effect of sending the bill back to Committee.

School Priority Established.—Shop teachers who had been entertaining some worries about maintaining adequate facilities during the present emergency will be glad to hear of the latest order of the National Production Authority of the U. S. Department of Commerce.

This order (Regulation No. 4) assures all establishments in the country, including schools, of the opportunity to secure needed equipment and supplies for maintenance, repair, and operation of their present facilities. The rating is intended to keep the nation's production and service facilities in good repair.

If difficulty is experienced in securing needed items, schools may make use of a priority rating (DO-97) for this purpose. The "MRO" priority can be used only for maintenance, repair, and operating supplies, and minor capital additions (such as new shop machinery) not exceeding $750. It cannot be used to purchase major capital items. It is equal to all other DO ratings.

Purchases under the regulation are limited in any one calendar quarter to one-fourth what was spent for that purpose during all of 1950. If the shop teacher does not need to use this priority to get needed material he is not limited in the amount he may buy. However, if he does take advantage of the priority, he must charge against his quota all purchases made without its use.

New schools started this year may acquire for maintenance, repair, and operation purposes the minimum amounts

(*Continued on page* 93)

INDEX TO ADVERTISERS

Adjustable Clamp Co. 86
Allied Radio Corp. 87
Aluminum Company of America 74
Alvin Co. 94
American Handicrafts Co. 82
American Technical Society 76
American Type Founders 52
E. C. Atkins & Co. 3
Atlas Press Co. 36
Chas. A. Bennett Co., Inc. 59
Berkroy Products, Inc. 68
Billings & Spencer Co. 55
Boice-Crane Co. 63, 94
Boyce-Roche Book Co. 80
Bradley University 89
Brodhead-Garrett Co. 48, 49
Brunner Mfg. Co. 91
Burke Machine Tool Co. 28
Buss Machine Works 20
Cadillac Plastic Co. 87
Canvas Products Corp. 85
R. Caluwaerts Co., Inc. 95
Chicago Wheel & Mfg. Co. 93
Cincinnati Lathe & Tool Co. 29
Cincinnati Milling Machine Co. 25
Cincinnati Shaper Co. 33
Cincinnati Tool Co. 8
Columbian Vise & Mfg. Co. 15
D. W. Cope—Plastics 90
Cornell University 87
Coyne Electrical School 80
Craft Service 92
Craftsman Wood Service Co. 83
Dake Engine Co. 82
Delmar Publishers, Inc. 81
Delta Power Tool Div.' Rockwell Mfg. Co. 18, 19
Design Craft, Inc. 94
Henry Disston & Sons, Inc. 24
Wm. Dixon, Inc. 38
Donjer Products Co. 90
"Dowl-it" Co. 92
Duro Metal Products Co. 67
Eagle Pencil Co. ..... cover 4
Elbar Products 85
Electric Hotpack Co. 71
Electronic Instrument Co. 82
Engineering Mfg. Co. 83
A. W. Faber—Castell Pencil Co. 57
Ford Motor Co. 4
Foredom Electric Co. 2
Franklin Glue Co. ..... cover 2
Gearon Co. 94
General Binding Corp. 65
General Finishes Sales & Service 91
Goodheart-Willcox Co. 80
Greenlee Tool Co. 59
Gyro Lamp & Shade Corp. 94
Jam Handy Organization 72
Harper Electric Furnace Corp. 91
D. C. Heath & Co. 81
Higgins Ink Co., Inc. 75
International Textbook Co. 77
J. C. Larson Co. 93
R. K. LeBlond Machine Tool Co. ..... cover 3
Lima Electric Motor Co. 66
Lincoln Electric Co. 90
Logan Engineering Co. 32
Lufkin Rule Co. 10
L-W Chuck Co. 28
Macmillan Co. 12
Marvin Machine Products, Inc. 35
McEnglevan Heat Treating & Mfg. Co. 74
McGraw-Hill Book Co. 77
McGraw-Hill Book Co., Text-Film Dept. 73
Metal Crafts Supply Co. 92
Millers Falls Co. 21
Morgan Vise Co. 89
MoToR Book Dept. 81
National Forge & Ordnance Co. 28
North Bros. Mfg. Co. 70
Ohmite Mfg. Co. 91
Oliver Machinery Co. 16
O'Neil-Irwin Mfg. Co. 89
Oswego State Teachers College 82
Parks Woodworking Machine Co. 83
Pennsylvania State College 70
Pereny Equipment Co. 58
Petersen Bros. 94
Pioneer Projects 85
Plastic Parts & Sales 88
Plastic Products Co. 94
Plastic Supply Co. 92
Fayette R. Plumb, Inc. 88
Popular Homecraft 70
Porter Cable Machine Co. 61
Frederick Post Co. 44
Prentice-Hall, Inc. 79
John F. Rider Publisher, Inc. 40
Russo Handicraft Supplies 94
Howard W. Sams & Co., Inc. 95
School Shop Aids 95
E. H. Sheldon & Co. 60
Sheldon Machine Co., Inc. 64
Shell Oil Co. 74
Shopsmith 11
Skilsaw, Inc. 69
South Bend Lathe Works 30
Speedway Mfg. Co. 89
Stanley Electric Tools 61
Stanley Tools 71
The L. S. Starrett Co. 56
State Finance Co. 94
U-Mak-It Products 85
Universal Scientific Co., Inc. 92
Utica Drop Forge & Tool Corp. 38
D. VanNostrand Co., Inc. 79
Walker-Turner Co., Inc. 22
J. D. Wallace & Co. 91
Wells Mfg. Corp. 3
Western Materials Co. 28
Weston Electrical Instrument Corp. 50
Wetzler Clamp Co. 87
X-acto Crescent Products Co. 95

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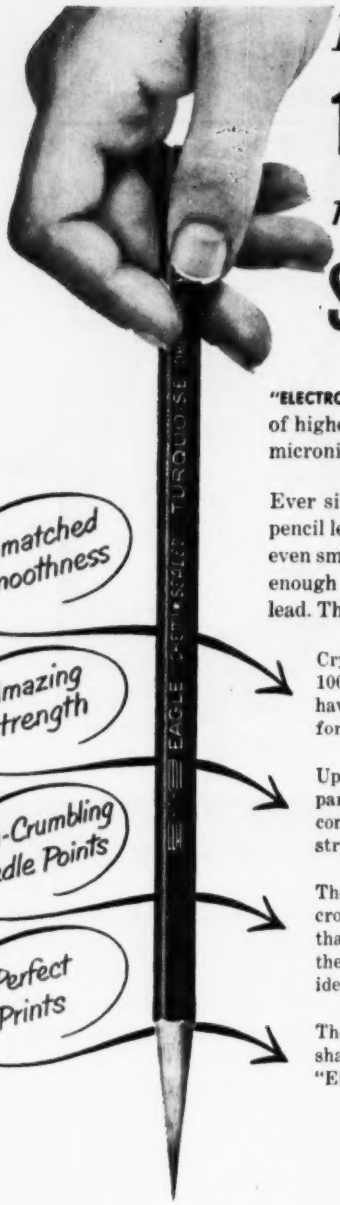

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*8